
SEDIMENT REMEDIAL DESIGN
FINAL SAMPLING DATA SUMMARY REPORT
MCCORMICK & BAXTER CREOSOTING
COMPANY
PORTLAND, OREGON

Prepared for:



Oregon Department of Environmental Quality
811 Southwest Sixth Avenue
Portland, Oregon 97204

February 2001

Task Order No.: 88-97-19



ecology and environment, inc.



**Final
Sediment Remedial Design
Data Summary Report
McCormick & Baxter
Creosoting Company
Portland Plant
Portland, Oregon**

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Introduction

E & E
Ecology and
Environment, Inc.

DEQ
Oregon Department of
Environmental Quality

RD
remedial design

McCormick & Baxter
McCormick & Baxter
Creosoting Company,
Portland Plant

RA
remedial action

ROD
Record of Decision

PAHs
polynuclear aromatic
hydrocarbons

PCP
pentachlorophenol

SQAP
sampling and quality
assurance plan

RI
remedial investigation

PTI
PTI Environmental
Services

FS
feasibility study

Ecology and Environment, Inc., (E & E) under contract to the Oregon Department of Environmental Quality (DEQ), has prepared this document to report the results of sediment sampling activities in support of the remedial design (RD) for contaminated sediment at the McCormick & Baxter Creosoting Company, Portland Plant, (McCormick & Baxter) site in Portland, Oregon. This document was prepared under Task Order No. 88-97-19. The purpose of the task order is to evaluate RD and remedial action (RA) activities at the site in accordance with the remedy described in the Record of Decision (ROD) dated March 1996 and amended in March 1998. The ROD identifies remedies for soil, sediment, and groundwater contaminated mainly with polynuclear aromatic hydrocarbons (PAHs), pentachlorophenol (PCP), arsenic, and dioxins/furans. The contamination resulted from wood-treating operations conducted on the McCormick & Baxter property from 1944 to 1991. A summary of the nature and extent of contamination at the McCormick & Baxter site is presented in *Sediment Remedial Design, Sampling and Quality Assurance Plan* (SQAP; E & E 1999) and *Sediment Remedial Design, Sampling and Quality Assurance Plan Amendment* (E & E 2000b). The selected sediment remedy for the site involves capping Willamette River sediment contaminated above cleanup goals.

Following this introductory section, the data summary report presents a description of field activities (Section 2), analytical results (Section 3), conclusions (Section 4), and references (Section 5).

1.1 Site Description and Background

The McCormick & Baxter site encompasses approximately 43 acres on land and 15 acres in the Willamette River in Portland. A description and history of the site, mainly excerpted from the remedial investigation (RI) report (PTI Environmental Services [PTI] 1992a), revised feasibility study (FS) report (PTI 1995), biological evaluation (E & E 2000a), and ROD, are provided below.



The McCormick & Baxter site (see Figure 1-1) is located on the Willamette River in Portland, downstream of Swan Island and upstream of the St. Johns Bridge. The Willamette River flows to the northwest adjacent to the site. The site is located on an area that was constructed by placement of dredged material sometime in the early 1900s. The site, which encompasses approximately 43 acres on land and 15 acres in the river, is generally flat and lies between a 120-foot-high bluff along the northeast border and a 20-foot-high bank along the Willamette River to the southwest. A sandy beach is exposed at the base of the bank, except during brief periods of high river stage (generally late winter or early spring). The site is bordered by inactive industrial properties along the river and by a residential area on the bluff.

In the early 1900s, the first industrial structure, a sawmill, was built at the site. In 1944, the McCormick & Baxter Creosoting Company began wood-treating operations that continued until October 10, 1991. The current configuration of the McCormick & Baxter property is shown in Figure 1-2 and discussed in Section 1.3.

Former site features that extended into the Willamette River included a creosote dock and log loading area. Both were removed in 1999. RI sediment investigations concurred that the highest levels of sediment contamination existed near the creosote dock and around the rocky point under the railroad bridge. Sediment contamination, primarily PAHs, also included slightly elevated levels of arsenic, chromium, dioxins/furans, and PCP. Historic sediment contamination likely resulted from spills, discharges to the Willamette River from outfalls located on site, and contaminated groundwater seeps.

NAPL
nonaqueous phase liquid

LNAPL
lighter-than-water
nonaqueous phase liquid

DNAPL
denser-than-water
nonaqueous phase liquid

Wood-treating contaminants generally are not soluble in water, and they either float on the water table or continue to sink depending on the density of the waste compared to that of the water. These relatively insoluble materials, generally PAHs, commonly are described as *nonaqueous phase liquid (NAPL)*. NAPL that is lighter than water (i.e., floats) is referred to as *lighter-than-water nonaqueous phase liquid (LNAPL)*, and NAPL that is heavier than water (i.e., has a higher density and sinks) is referred to as *denser-than-water nonaqueous phase liquid (DNAPL)*. However, because of the NAPL's density, compared to that of water, NAPL is present in small "globs" of separate-phase product throughout the saturated thickness of the aquifer. NAPL is also present in offshore sediments from contaminated groundwater seeps.



TFA
tank farm area

FWDA
former waste disposal
area

MSL
mean sea level

LPAHs
low-molecular-weight
PAHs

Based on the results of sampling conducted by PTI during the RI, the areas of contaminated sediment are located downgradient of the NAPL plumes in the tank farm area [TFA] and former waste disposal area [FWDA]. Samples collected as part of the 1997 Portland Harbor study yielded results that were generally lower in concentration than the results from the RI. None of the samples are close enough to allow a direct comparison.

Subsurface sample data indicated that contamination may extend as deep as 35 feet in heavily contaminated areas. Beach seeps and sheens observed on the river and related to bleb releases from sediment are seasonal in nature, typically occurring in late summer when the river stage is below 3 feet mean sea level (MSL). In addition, areas near the former creosote dock were observed to have ongoing discharges, as evidenced by sheens on the river surface.

Investigations of the former creosote dock area were conducted during the RI in order to evaluate the presence and locations of existing NAPL pool areas in the near-shore sediment, the practicability of NAPL extraction from NAPL pools located in near-shore sediment, and the effectiveness of upland NAPL extraction efforts in preventing continued migration of NAPL into near-shore sediment. Wells were installed in the sediment during the RI but since have been destroyed by river debris. Conclusions of these additional sediment investigations include the following:

- ▲ The only recoverable NAPL was found in sediment in an area around the former creosote dock. LNAPL thicknesses (between 0.5 foot and 1 foot thick) were measured in three sediment wells; however, no DNAPL has been measured in any of the sediment wells. The LNAPL may represent a fractionation of a mixture of NAPLs present in the sediment;
- ▲ The composition of the NAPL removed from sediment well SEDW-3 included aliphatic hydrocarbons (approximately 7%) and low-molecular-weight PAHs (LPAHs; approximately 14%);
- ▲ Where present, NAPL appears to be found in the upper 5 feet to 7 feet of the sediment. The interval from 7 feet to 15 feet does not yield NAPL, perhaps because this depth interval has a higher percentage of silt or finer-grain sediment;
- ▲ Based on apparent difficulty in intersecting extractable NAPL pools with sediment wells, the NAPL layers apparently may be



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thin and discontinuous, or migration of NAPL may be occurring along preferential pathways (i.e., differences in sediment composition from depositional differences or historical dredging, or a topographic low in the top of a silt zone in the sediment);

- ▲ Based on the limited NAPL extraction data from the near-shore sediment wells, the extent of readily extractable NAPL from sediment wells that had NAPL accumulations may be limited; and
- ▲ Discharge of NAPL (as indicated by an oily sheen on the river surface) to the sediment appears to be greatest during low river stages, when hydraulic gradients are steepest. Increases in air, soil, and water temperatures during summer may decrease the NAPL viscosity. This increase in temperature in the summer also coincides with the lowest river stages and sediment agitation caused by tidal fluctuations and river traffic, resulting in an apparent increase in NAPL discharge.

Based on the historical (RI) bioassay data, sediments at the site have significant toxicity according to Microtox and *Hyalella azteca* bioassays. Sediments causing the greatest adverse effects are distributed around the former creosote dock and upstream of the former creosote dock, along the shoreline. Sediments causing significant, but fewer, adverse effects are present near the north seep and railroad bridge.

1.1.1 Land Use

Land use at the site has been industrial since the 1940s. Future re-use of the site could include industrial or recreational scenarios with in-place institutional controls (e.g., deed restrictions). Development of an industrial area is proposed at the former Riedel International property to the southeast, and development of a greenspace park is proposed by the Metropolitan Service District at the Willamette Cove property to the northwest. Established railroad rights-of-way are on two sides of the site, and the area on top of the bluff is anticipated to remain residential.

1.1.2 Rare and Endangered Species

The McCormick & Baxter property is in a highly developed industrial area with little terrestrial wildlife habitat; however, numerous benthic (sediment-dwelling), aquatic, waterfowl, and amphibian species have been observed at the site. Two federally endangered species have been observed at the site: the peregrine falcon (*Falco peregrinus*) and the bald eagle (*Haliaeetus leucocephalus*). The



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CFR
Code of Federal
Regulations

peregrine falcon recently was delisted (50 Code of Federal Regulations [CFR] 17, August 25, 1999) pursuant to the Endangered Species Act (ESA) of 1973, as amended.

ESA
Endangered Species Act

The Lower Willamette River provides an adult and juvenile migratory corridor and juvenile rearing habitat for several anadromous fish species. These species are present in the river year-round as adults migrating upstream to spawn or juveniles migrating downstream to the ocean. Two runs of Chinook salmon, three runs of steelhead trout, and one run of coho salmon occur in the area. Cutthroat trout are also present in the Willamette River, but their abundance is low (National Oceanic and Atmospheric Administration [NOAA] 1992). Several of the evolutionarily significant units (ESUs) of the Willamette River either are listed or are proposed for listing under the ESA (50 CFR 17.11 and 17.12). These include ESUs of Chinook, steelhead, coho, and sea-run cutthroat for listed proposed and candidate species.

NOAA
National Oceanic and
Atmospheric
Administration

ESUs
evolutionarily significant
units

EPA
United States
Environmental Protection
Agency

Steelhead from the Willamette River downstream of Willamette Falls are included in the Lower Columbia River ESU and were listed as a threatened species in March 1998. Steelhead from Willamette River tributaries upstream of Willamette Falls are included in the Upper Willamette River ESU and were proposed as a threatened species in March 1998. Spring Chinook salmon from Willamette River tributaries downstream of Willamette Falls are included in the Lower Columbia River ESU and were proposed as a threatened species in March 1998. Spring Chinook salmon from Willamette River tributaries upstream of Willamette Falls are included in the Upper Columbia River ESU and were proposed as a threatened species in March 1998. Coho salmon from Willamette River tributaries downstream of Willamette Falls are included in the Lower Columbia River ESU and are a candidate species for listing. Sea-run cutthroat in the Willamette River are part of the West Coast population considered a candidate for listing.

1.2 Site Regulatory History

In 1983, E & E performed a site inspection for the United States Environmental Protection Agency (EPA), Region 10, under the Zone II Field Investigation Team contract. In August 1983, the McCormick & Baxter Creosoting Company performed a preliminary site investigation (AquaResources, Inc. 1983) and notified DEQ of possible off-site releases near the FWDA. Subsequently, CH2M Hill was retained by the McCormick & Baxter Creosoting Company to perform a site investigation, which was completed in 1985. The investigation report concluded that soil and groundwater contamination exist at the site, but that no emergency actions

are necessary to protect off-site populations (CH2M Hill 1985, 1987).

On November 24, 1987, a Stipulation and Final Order was signed by the McCormick & Baxter Creosoting Company and DEQ, requiring the firm to perform specified RA activities. Not all of these requirements were completed by the time the facility was closed on October 10, 1991. DEQ conducted an RI/FS from September 1990 to September 1992 (PTI 1992a, 1992b).

GTS
groundwater treatment
system

BNRR
Burlington Northern
Railroad

DEQ issued a proposed cleanup plan in 1993. However, DEQ elected to not finalize the plan because of the pending addition of the site to the National Priorities List (NPL) by EPA. DEQ instead began to implement several interim removal action measures (IRAMs), which were elements of the 1993 DEQ proposed plan, while awaiting a final decision from EPA regarding inclusion of the McCormick & Baxter site on the NPL. EPA added the site to the NPL on June 1, 1994.

Since completion of the RI/FS in 1992, DEQ has conducted several IRAMs and additional site characterization. Based on implementation and/or completion of the IRAMs, collection of additional site data since the 1992 FS, and experience gained at other wood-treating sites, DEQ chose to revise the 1992 FS to incorporate new data and updated remedial alternatives. The revised FS report (PTI 1995) describes the updated RA alternatives for the McCormick & Baxter site and incorporates IRAMs conducted since the 1992 FS.

A new proposed plan describing DEQ and EPA's preferred remedy was issued on October 30, 1995. The public comment period began on November 6, 1995, and ended on January 15, 1996. A public meeting was conducted on November 28, 1995. After considering the comments received during the public comment period, DEQ and EPA issued the ROD, specifying the selected remedy, in March 1996. DEQ conducted public meetings on April 23 and May 29, 1996, to discuss the ROD and the selected remedy. The ROD was amended in March 1998 to revise the soil remedy from on-site treatment to off-site disposal.

1.3 Current Site Configuration

The current configuration of the site is shown in Figure 1-2. The McCormick & Baxter property is accessed via the partially paved North Edgewater Street, which leads from Willamette Boulevard to the Union Pacific Railroad tracks at the base of the bluff. The driveway leading into the property and the parking lot are paved. The remainder of the property is unpaved, covered with gravel, or



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vegetated. A former shop building (currently used to house the TFA groundwater treatment plant) is the only original structure remaining on site. Two office trailers and an intermodal container (housing the FWDA groundwater treatment system [GTS]) are the only other structures remaining on site. In addition, a NAPL storage tank is located in the FWDA. This tank is in a lined and bermed secondary containment. The entire site is fenced, and warning signs are posted on the fence around the perimeter of the site. Also located on site are NAPL storage tanks in the TFA and a NAPL storage tank adjacent to the shop building.

The FWDA treatment system and TFA treatment systems are not operating. Discharge lines from the FWDA and TFA treatment systems extend to the Willamette River (see Figure 1-2). During operation, effluent from both treatment systems is discharged to the Willamette River under requirements set by the site's National Pollutant Discharge Elimination System permit.

Utility service at the site includes water provided by the City of Portland to the office trailers, the former shop building, and several fire hydrants. Electrical service is provided by Portland General Electric Company to the office trailers, the former shop building, the FWDA GTS, and security lights mounted on several overhead poles. Two pressurized sewer lines are located on the west side of the site adjacent to the Burlington Northern Railroad (BNRR) tracks. One line extends beneath the FWDA near the beach before crossing beneath the Willamette River (see Figure 1-2). The other, combined sewer line is located on the east side of the site adjacent to the former Riedel International property. Former site features, including a creosote dock and log loader, were removed during the RA soil removal in 1999.

1.4 Physical Setting

The McCormick & Baxter property is located on a terrace that is generally flat, with surface elevations ranging from approximately 29 feet to 36 feet MSL (referenced to City of Portland datum). The site is part of a larger industrial area that includes a former cooperage and shipyard to the northwest (Willamette Cove property) and the former Riedel International property to the southeast. The BNRR tracks that border the site on the northwest are located on an embankment that is elevated approximately 40 feet above the site. The northeast side of the site is bordered by Union Pacific Railroad tracks and a naturally formed, 120-foot-high bluff. Atop this bluff is a residential area. A narrow, vegetated, 20-foot bank separates the site from the Willamette River to the southwest. A sandy beach is exposed at the base of the bank, except during periods in



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late winter or early spring when higher river stages (greater than 15 feet) prevail. Surveyed beach elevations generally range from 10 feet to 15 feet MSL.

CPA
central process area

USACE
United States Army
Corps of Engineers

CRD
Columbia River Datum

NGVD
National Geodetic
Vertical Datum

Elevations on the site are generally highest at the base of the 120-foot-high bluff, ranging from 30 feet to 36 feet, and gradually decrease toward the river. Elevations northwest of the central process area (CPA) range from 33 feet to 36 feet, except for the BNRR spur line, which slopes down to the site from an elevation of approximately 40 feet. Southeast of the CPA, elevations generally range from 29 feet to 33 feet. The lowest elevations on site are along the southeast fence line adjacent to the former Riedel International property and in the southeast waste disposal trench.

The McCormick & Baxter site is located at River Mile 7 on the Willamette River. Along this reach, the river flows to the northwest and is about 1,500 feet wide. Channel sounding maps for January 1991 from the United States Army Corps of Engineers (USACE) indicate that adjacent to the site, the channel is maintained at a width of approximately 600 feet and to a maximum depth of approximately 40 feet to 50 feet below the Columbia River Datum (CRD). The CRD is 1.74 feet above the National Geodetic Vertical Datum (NGVD) 1929. The NGVD is approximately equal to MSL and appears to have been used as a control for the site topographic survey. An additional 500-foot-wide embayment is along the south portion of the McCormick & Baxter property, with river depths in the embayment ranging from +10 feet to -25 feet NGVD. USACE maps indicate that steep slopes to the dredged navigational channel occur along a line that is essentially parallel to the flow and approximately 150 feet off the shoreline, or 300 feet from the embayment shoreline.

The elevation of the 100-year flood plain along this reach of the Willamette River is 28 feet NGVD 1929, and the elevation of the 500-year flood plain is 32 feet NGVD. A 100-year flood would rise up the bank to within a few feet of the terrace. A storm event of this magnitude occurred in February 1996. A 500-year flood would encroach onto the southeast portion of the site, flooding most of the former untreated wood storage areas southeast of the tank farm and creosote tank.

1.4.1 Geology and Hydrology

The McCormick & Baxter site is located in an area of sand fill adjacent to the Willamette River. Three hydrostratigraphic units are present at the site: the shallow, intermediate, and deep aquifer

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BGS
below ground surface

zones, which are interconnected to varying degrees depending on the location within the site.

The shallow, unconfined, sand fill aquifer is present across the entire site and ranges in thickness from about 5 feet to greater than 30 feet. Depth of groundwater ranges from approximately 20 feet to 25 feet below ground surface (BGS). The base of the shallow aquifer is defined by a silt aquitard that ranges in thickness from 0 feet to greater than 100 feet. The silt aquitard is thickest near the central portion of the site (i.e., in the TFA) and thins toward the Willamette River. At the Willamette River, the silt aquitard is truncated and a thick sequence of poorly graded sands extends from ground surface to at least 80 feet BGS. In this area, the aquifer zones are hydraulically connected and form a single, continuous, unconfined aquifer near the river boundary. Depth intervals along the river are referred to as shallow, intermediate, and deep zones of a single aquifer that is separated into distinct aquifers landward.

The intermediate aquifer comprises fine- to medium-grain alluvial sand and is present below the silt aquitard. The intermediate aquifer varies in thickness from 0 feet to greater than 50 feet BGS. In the CPA, the intermediate aquifer is approximately 12 feet thick and is hydraulically separated from the shallow aquifer. In the TFA, the silt aquitard is greater than 100 feet thick and no intermediate aquifer is present. In other portions of the site, the intermediate zone is separated from the shallow zone by a thin silt aquitard and the intermediate zone is up to 50 feet or more in thickness. In these areas, the intermediate and deep zones are not separated by a continuous confining layer but apparently are in hydraulic connection.

The deep aquifer zone is present in all portions of the site. As described previously, the deep zone is in alluvial sands and is connected directly with the intermediate and shallow zones along the river margin. Near the center of the site, the deep zone is separated from the shallow zone by more than 100 feet of low-permeability silt. Near the bluff, the deep aquifer comprises gravel and sands of the Troutdale Formation and catastrophic flood deposits.

Groundwater gradients in the shallow, intermediate, and deep zones are generally from the bluff toward the river. However, there are periodic reversals of gradient from the river to the site, near the shoreline.

The City of Portland supplies drinking water to residential areas in north Portland, including the site. The source of this drinking wa-



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ter is the Bull Run Reservoir located approximately 40 miles east of Portland. This water supply is supplemented by an East Multnomah County well field (approximately 10 miles east of the site) that uses deep aquifers in the Troutdale Formation. The only current use of groundwater in the site vicinity is by the University of Portland, which operates a supply well for irrigation. This supply well is completed in the deep aquifer, which has not been affected by the site.

1.4.2. Surface Water

cfs
cubic feet per second

The Willamette River is the only surface water body at the site. Near the site, the river flows from 8,300 cubic feet per second (cfs) in summer to 73,000 cfs in winter and is approximately 1,500 feet wide. The Willamette River is a major river that flows through Portland and joins the Columbia River approximately 7 miles northwest of the site. The Willamette River is not used as a drinking water source downstream of the site.

There were four outfalls on the McCormick & Baxter property, three of which were stormwater outfalls (Outfalls 002, 003, and 004). These outfalls were removed in spring 1999 as part of the Phase I soil RA. Following shutdown of the McCormick & Baxter facility, earthen berms were placed around stormwater collection sumps to minimize off-site discharge through these outfalls. Currently, stormwater at the site infiltrates into the subsurface.

1.5 Remedial Design Objectives

This section briefly describes the selected remedy and cleanup goals for sediment and provides a discussion of the RD objectives.

The selected remedy for sediment includes capping areas that contain contaminants above risk-based cleanup levels for human health and/or that exhibit significant biological toxicity. Additional major components of the sediment remedy include:

- 1) Sampling surface and near-surface sediment to determine contaminant concentrations and the level of attenuation of contaminant concentrations and toxicity since completion of the RI sediment monitoring and facility closure in 1991;
- 2) Collection of Willamette River hydrodynamic data necessary for effective cap design and control of cap erosion;
- 3) Long-term monitoring of the cap and surrounding areas following installation; and

- 4) Institutional controls to ensure that the cap integrity is maintained.

B(a)P
benzo(a)pyrene

AWQC
ambient water quality
criteria

Cleanup goals for sediment were developed to protect human health (see Table 1-1). In general, these human-health-based sediment goals are also protective of benthic organisms, except for one compound: benzo(a)pyrene (B(a)P). The cap will consist of sand or other readily available clean fill suitable for placement in water. The cap will be at least 3 feet thick and may be armored in areas susceptible to erosion by river currents or vessel-induced wave action.

Within the probable extent of the cap are structures such as abandoned pilings and the submerged parts of the creosote pier that must be removed or otherwise addressed. Additionally, the pilings or footing of the BNRR bridge are within the extent of the cap.

The remedial action objectives for sediment are the prevention of direct human or aquatic organism contact with contaminated sediment and the minimization of releases of contaminants from the sediment that might result in contamination of the Willamette River in excess of federal and state ambient water quality criteria (AWQC). Surface water sampling results will be used to assess the protectiveness of the sediment cap and the effectiveness of the NAPL extraction program.

The sediment remedy is related to the groundwater remedy. Contaminant flux from the groundwater to sediment still is occurring at the site. If it is determined that the contaminant flux to the river poses potential risks to human health or the environment, additional remedial measures, such as increased groundwater extraction, reassessment of alternative cleanup levels and compliance points, or installation of a physical barrier, may be required. To reduce the contaminant flux and allow the goals of the sediment remedy to be achieved, an impermeable barrier wall is proposed for installation as part of the groundwater remedy.

Table 1-1

**CLEANUP GOALS FOR SEDIMENT
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND PLANT
PORTLAND, OREGON**

Compound	Sediment Concentration (mg/kg, dry weight)
Arsenic	12 ^a
Pentachlorophenol	100 ^b
Carcinogenic PAHs	2 ^b
Dioxins/furans	0.008 ^{b,c}
Protection of Benthic Organisms	Verification Criteria
Prevent exposure of benthic organisms to sediment contamination above known toxicity levels	Bioassay tests resulting in a mortality rate less than or equal to upstream reference sample results.

^a Based on concentrations at upstream reference station.

^b Based on an acceptable risk of 1×10^{-6} for recreational exposure scenario.
Exposure to sediment is not considered relevant to occupational scenarios.
Exposure under the residential scenario would be similar to that assumed for the recreational scenario.

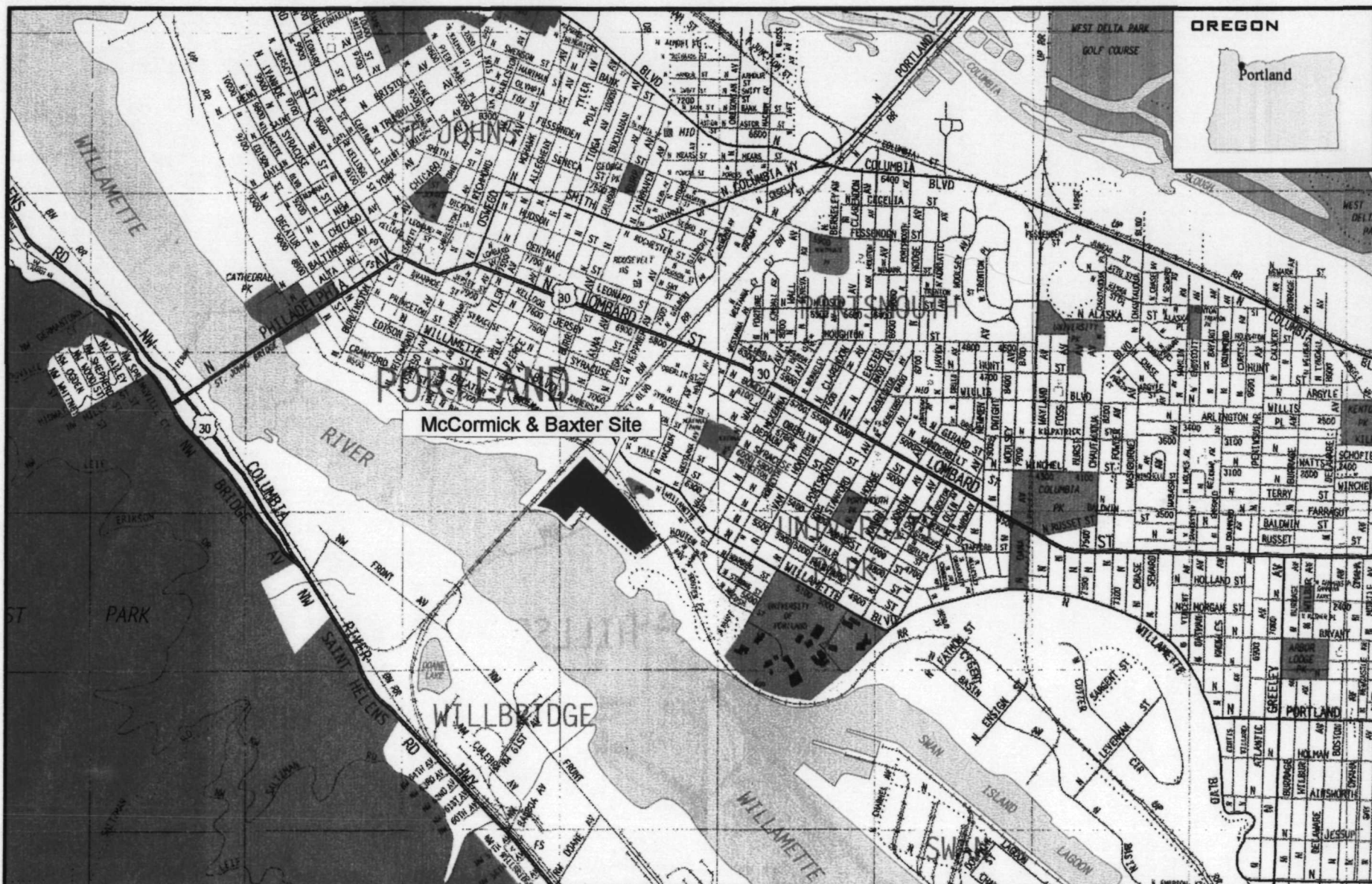
^c Expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin toxic equivalent concentrations.

Key:

Dioxins/furans = Polychlorinated dibenzo-*p*-dioxins and dibenzofurans.

mg/kg = Milligrams per kilogram.

PAHs = Polynuclear aromatic hydrocarbons.



ecology and environment, inc.
International Specialists in the Environment
Portland, Oregon

MCCORMICK & BAXTER CREOSOTING CO.
PORTLAND, OREGON



0 .25 .5
Approximate Scale in Miles

FIGURE 1-1

SITE LOCATION MAP

Drawn By:
AES

Date
12-9-98

TDD/Job No.
OH4270

Dwg. No.
OH4270F22

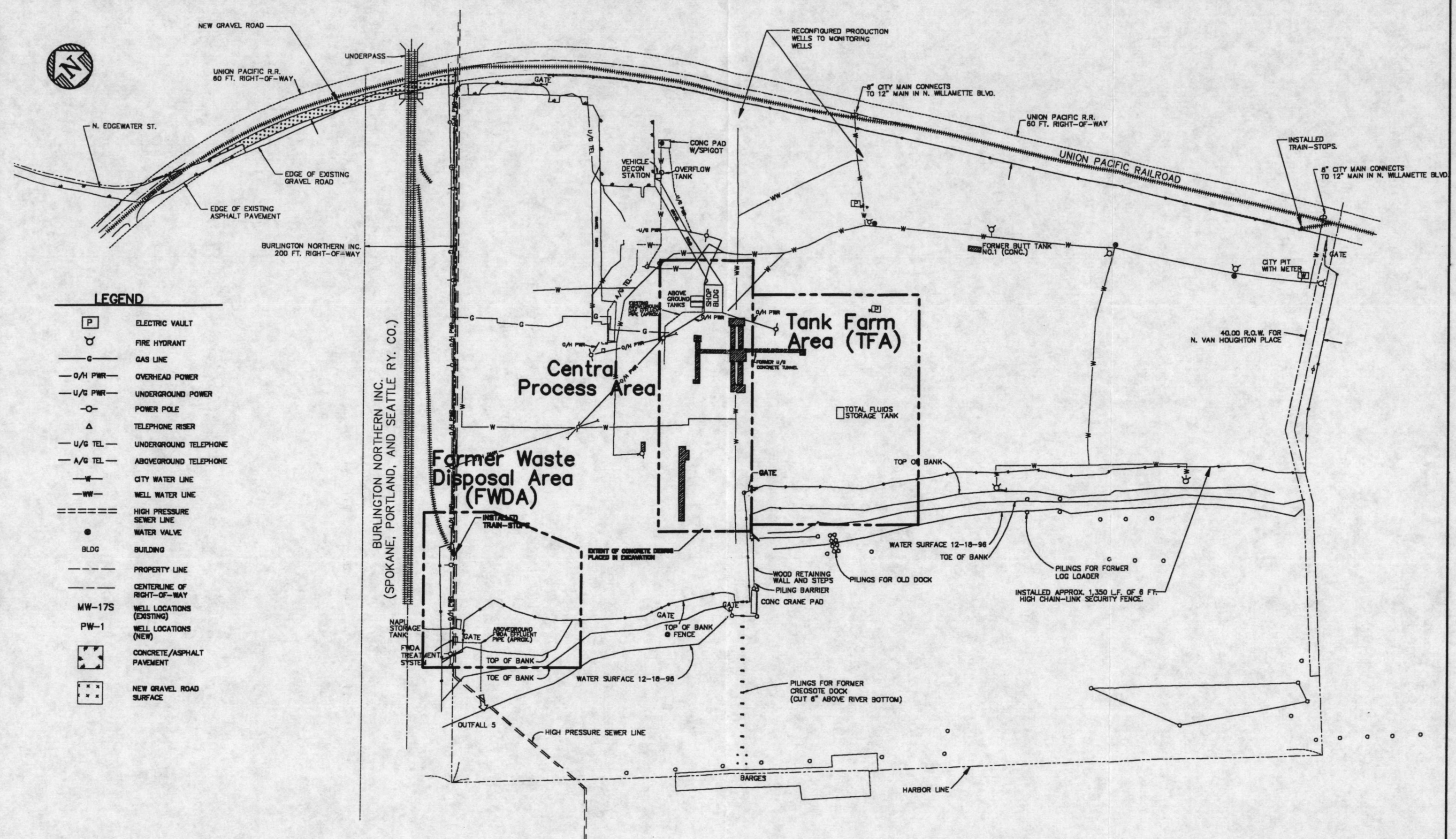


FIGURE 1-2
CURRENT SITE CONFIGURATION
WITH CONTAMINANT SOURCE AREAS
McCORMICK & BAXTER CO. SITE
PORTLAND, OREGON

SCALE	DATE	DRAWING FILE NO.	FIGURE NO.
1" = 200'	02-28-2000	OF4F2_28.dwg	1-2

SCALE IN FEET
0 200 400 600

2

Summary of Field Investigations

This data summary report discusses the Phase I and Phase II RD field activities performed at the McCormick & Baxter site and at reference locations during October 1999 and January and February 2001, respectively. Section 2.2 summarizes field sampling activities, including any deviations from the sampling equipment and methods specified in the SQAP and SQAP amendment (E & E 1999 and 2000b).

2.1 Sampling Activities

Phase I RD sampling activities were conducted in October 1999 (see Section 2.1.1) in accordance with the procedures outlined in the SQAP (E & E 1999). Phase II RD sampling activities were conducted in January and February 2001 (Section 2.1.2) in accordance with the SQAP amendment (E & E 2000b). Phase II RD field activities were conducted in order to address data gaps identified during Phase I field activities, including the lateral extent of contamination and parameters required for permeation modeling.

2.1.1 Phase I Remedial Design Sampling Activities, October 1999

Sediment and surface water sampling was conducted in October 1999. Figure 2-1 displays the 1999 McCormick & Baxter site sediment and surface water sampling locations. A bathymetric survey was performed by David Evans and Associates, Inc., (DEA) on October 20, 1999. The following sections describe the sediment and surface water sampling field activities.

2.1.1.1 Sediment Sampling Activities

In October 1999, E & E collected 39 sediment samples at the McCormick & Baxter site, from the sampling raft of subcontractor Transglobal Exploration and Geosciences, Inc. (TEG). A Global Positioning System (GPS) unit, utilizing satellite locating methods, was used to field locate the proposed sediment sample locations at the time that the samples were collected. TEG's GPS unit was used for the first eight sample locations but was determined to be

DEA
David Evans and
Associates, Inc.

TEG
Transglobal Exploration
and Geosciences, Inc.

GPS
Global Positioning
System



2. Summary of Field Investigations

too inaccurate. E & E rented a different GPS unit to provide greater accuracy for the remaining sample locations. If a proposed sample location could not be sampled because of obstructions, then an alternative location as close as possible to the proposed location was sampled. Sample collection near the site began in near-shore areas at Willamette Cove and continued upstream until the reference areas were sampled.

Four reference samples were collected upstream of the site on the Willamette River, between Ross Island and Willamette Falls. The rationale for choosing these reference locations included inferences regarding the nature of the substrate and extent of chemical contamination at each location; i.e., chosen locations were assumed to have sediment of similar grain size as on-site sediment samples and to not be affected by chemical contamination. The reference samples were collected using a winch on the back of DEA's survey boat. These reference locations were surveyed using the GPS equipment on the DEA vessel. DEA's equipment and vessel, rather than TEG's sampling raft, were used at the upstream locations because TEG's barge would have been inadequate to maneuver at the upstream locations.

SOP standard operating procedure

The use of the sediment sampling equipment and the sediment sampling process followed E & E's standard operating procedure (SOP) for sediment sampling (E & E 1998). The surface water depth of each river sediment sample was measured in the field using a water level indicator lowered to the sediment surface. River sediment samples were collected from the top 6 inches using a nondedicated stainless steel Ponar bottom grab sampler deployed using an A-frame on the sampling platform or vessel.

Samples were composited from an average of three grabs at each location. However, some samples required up to 12 grabs at one location in order to obtain sufficient sample quantities for all analyses. The sampler was decontaminated between river sample locations. Beach samples were collected by hand using a dedicated stainless steel spoon. Onshore and offshore sediment samples were homogenized in large aluminum pie pans before being transferred to sample containers. Disposable aluminum pie pans were used instead of a stainless steel bowl, as proposed in the work plan, to reduce the amount of decontamination that would be required while the field team worked on the water.

A geologist performed a qualitative survey of all sediment samples by visually inspecting grain size and color, benthic organisms, and evidence of contamination. Field notes describing the sediment

2. Summary of Field Investigations

samples are summarized in Table 2-1. Four additional grab samples were collected for visual descriptions at locations approximately 50 feet and 100 feet upstream and downstream of sample location MBSED99-17. At DEQ's request, these visual samples were collected because of the large amount of contamination visible at the original location. In addition to the qualitative survey, a photographic log of each sediment sample was created. Sediment ring density was measured in the field by collecting sediment in a container of known volume (2-inch by 6-inch polyvinyl chloride [PVC] tube) and recording the weight of the sediment.

PVC
polyvinyl chloride

OAL
Oregon Analytical
Laboratory

QA
quality assurance

QC
quality control

Sediment samples were hand-delivered to Oregon Analytical Laboratory (OAL) for toxicity testing and analysis for arsenic, PCP, PAHs, grain size, and dioxins/furans. Analytical results are presented in Section 3.

2.1.1.2 Surface Water Sampling Activities

Five surface water samples were collected for PAH, PCP, and arsenic analyses. A GPS unit was used to determine the proposed surface water sample locations at the time that the samples were collected. If a proposed sample location could not be sampled because of obstructions, then an alternative location close to the proposed location was sampled. Figure 2-1 displays the five surface water sample locations at the McCormick & Baxter site. Surface water samples were not collected at the sediment sample reference locations.

The water depth of each surface water sample was measured with a water level indicator. Surface water samples were collected using a nondedicated Van Dorn bottle lowered to the interface between the sediment and surface water. The Van Dorn bottle was decontaminated between surface water sample locations. Surface water samples were submitted by hand to OAL for PAH, PCP, and arsenic analyses. See Section 3.4 for a description of quality assurance (QA)/quality control (QC) surface water samples.

2.1.1.3 Bathymetric Survey

DEA conducted a bathymetric survey (see Figure 2-1) at the site to document Willamette River bottom elevations. Measurements were taken from the centerline of the river up to the shoreline at the time of the survey. A section of the river of approximately 3,000 feet, extending approximately 600 feet downstream and 600 feet upstream of the site boundaries, was included in the survey. Multi-beam survey techniques were used for the portion of the survey within the shipping channel. Single-beam survey techniques were used in the shallow, near-shore waters. Survey elevations were



2. Summary of Field Investigations

referenced to the NGVD, and horizontal coordinates were referenced to the Oregon State Plane Coordinate system.

2.1.1.4 Toxicity Testing

Sediment was collected for bioassay analysis, including the *Hyalella azteca* 10-day toxicity test and the *Chironomus tentans* 10-day toxicity test, from all of the site and upstream sediment sample locations. Sediment was collected in 1-liter (L) glass jars and submitted to OAL for distribution to OAL's subcontracted laboratory, CH2M Hill, Corvallis, Oregon.

L
liter

Fred Devine
Fred Devine Diving &
Salvage Co.

DPGS
Differential Global
Positioning System

2.1.2 Phase II Remedial Design Sampling Activities, January and February 2001

Surface sediment sampling was conducted on January 5 and 8, 2001, in accordance with the SQAP amendment (E & E 2000b). Subsurface sediment coring was conducted on February 5, 2001. NAPL sampling was conducted on February 6, 2001. The following sections describe the sampling activities for these events.

2.1.2.1 Surface Sediment Sampling Activities

Additional surface sediment samples were collected in January 2001 in order to identify the lateral extent of contamination off shore from the McCormick & Baxter site. On January 5 and 8, 2001, sediment sampling activities were conducted on a charter boat owned and operated by Fred Devine Diving & Salvage Co. (Fred Devine), Portland, Oregon. Sediment sampling was conducted with the assistance of Fred Devine personnel including two divers and a boat operator.

Sediment samples were collected at 29 Lower Willamette River locations off shore from the McCormick & Baxter site (see Figure 2-2), and at one upstream Willamette River location at approximately River Mile 24. A Differential Global Positioning System (DGPS) was used to field locate the proposed sediment sample locations at the time that the samples were collected. E & E was able to sample each of the 30 locations without modification due to field conditions.

E & E's project geologist noted field observations for each sediment sample, including color; characterization of the substrate; and the presence of benthic organisms, organic matter, NAPL odor, and staining. A detailed taxonomic profile of benthic organisms was beyond the scope of the sediment sampling activities; however, E & E personnel noted the presence or absence of benthic organisms as incidentally observed. Observations are listed on

2. Summary of Field Investigations

field data sheets provided as Appendix A and summarized in Table 2-2.

Sediment was collected for bioassay analysis, including the *Hyalella azteca* 10-day toxicity test and the *Chironomus tentans* 10-day toxicity test, from 18 of the 30 sample locations. Sediment was collected for analysis of PAHs and grain size analysis from all 30 sample locations.

Fred Divine divers collected river sediment samples from the top 15 inches of the river bottom using a PVC plastic tube that was 15 inches long by 4 inches in diameter (an approximate volume of 0.8 gallon). The divers collected the sample sediment by driving the sampling tube into the river bottom. One sampling tube volume was required for PAH and grain size analysis. An additional sampling tube volume was required for toxicity testing. After the sediment was brought to the surface, E & E personnel prepared the sample for submittal to subcontracted laboratories for bioassay analysis (performed by MEC Analytical Systems, Inc., [MEC] Tiburon, California) and for analysis for physical and chemical parameters (performed by North Creek Analytical, Inc. [NCA], Beaverton, Oregon).

MEC
MEC Analytical Systems,
Inc.

NCA
North Creek Analytical, Inc.

The subcontracted laboratories supplied all sampling containers. Sediment was prepared for submittal to MEC for toxicity testing by collecting a minimum volume of 5 L of sediment in a 5-gallon bucket lined with a single "sediment bag" supplied by MEC. The "sediment bag" then was placed into a second bag and stored on ice in a cooler.

Sediment was prepared for submittal to NCA by placing a representative sample in an aluminum pie pan for homogenization using a stainless steel spoon. Sediment aliquots then were transferred to sample containers: an 8-ounce glass jar with a Teflon lid for analysis of PAHs, and a 16-ounce glass jar with a Teflon lid for grain size analysis. All sampling equipment, including sediment core devices, pans, and spoons, was dedicated for each sample location; therefore, decontamination of equipment between sample locations was unnecessary. Consequently, rinsate samples were not collected because only dedicated equipment was used.

2.1.2.2 Subsurface Sediment Sampling Activities

On February 5, 2001, subsurface sediment samples were collected at three Lower Willamette River locations (see Figure 2-2) off shore from the McCormick & Baxter site. All sample locations



2. Summary of Field Investigations

SVOC

semivolatile organic
compound

were determined using a DGPS and the sample positions indicated in *Final Sediment Remedial Design, Sampling and Quality Assurance Plan Amendment* (E & E 2000b).

Subsurface sediment was collected for sediment pore water analyses including dissolved organic carbon analysis and semivolatile organic compound (SVOC) analysis. Subsurface sediment also was collected with the intent to extract NAPL for physical testing required for permeation modeling of the sediment cap.

Drillers provided by GeoTech Explorations collected river sediment samples from approximately 10 feet below the top of the sediment surface using a Shelby tube and piston, collectively known as a *Henberger sampler*. After the sediment was brought to the surface, E & E personnel prepared the sample for submittal to the subcontracted laboratory, NCA, for analysis of chemical parameters. E & E personnel also prepared sediment bore logs for each subsurface sediment location (provided as Appendix B).

Sediment was prepared for submittal to NCA by placing a representative sample in an aluminum pie pan for homogenization using a stainless steel spoon. Sediment aliquots then were transferred to seven sample containers (all 1-L glass jars fitted with a Teflon lid) for analysis of SVOCs and dissolved organic carbon in pore water. All sampling equipment, including sediment core devices, pans, and spoons, were dedicated for each sample location. Therefore, decontamination of equipment between sample locations was unnecessary. Consequently, rinsate samples were not collected because only dedicated equipment was used.

During collection of the subsurface sediment samples, some NAPL odor and staining were present; however, NAPL was not present in the quantities required for extraction. Consequently, NAPL was not collected from the subsurface sediment for physical testing. Section 2.1.2.3 describes E & E's collection of NAPL from on-site monitoring wells for submittal for physical testing.

NCA has not finalized the sediment pore water analytical results. Upon receipt of the results from NCA, E & E will submit them in a technical memorandum to DEQ.

2.1.2.3 Nonaqueous Phase Liquid Sampling Activities

On February 6, 2001, E & E personnel collected LNAPL, DNAPL, and river water samples in order to provide data regarding the physical properties of NAPL required for permeation modeling of



2. Summary of Field Investigations

PTS
PTS Laboratories, Inc.

ASTM
American Society for
Testing and Materials

the cap. The LNAPL and DNAPL samples were submitted to the subcontracted laboratory (PTS Laboratories, Inc., [PTS] Sante Fe Springs, California) for analysis of density and viscosity by American Society for Testing and Materials (ASTM) Method D-445, and for analysis of interfacial tension by ASTM Method D-971. The river water sample was submitted to PTS for testing to determine the interfacial tension between the river water and NAPL.

Monitoring wells that had been confirmed to contain LNAPL within the month (including wells EW-23, EW-10, and MW-RS) were strained to collect LNAPL. Because LNAPL quantities per well were minimal, only 800 milliliters of the requested amount of 1 L was collected. Historically, DNAPL has not been present in the wells during winter. E & E sampled DNAPL by pumping it out of the on-site storage tank. This method required the pump to be below the water/DNAPL interface within the tank to prevent accidental sampling of LNAPL. River water, required for interfacial tension testing with NAPL, was sampled from the Willamette River, at beach locations downgradient of the FWDA and monitoring well EW-19s.

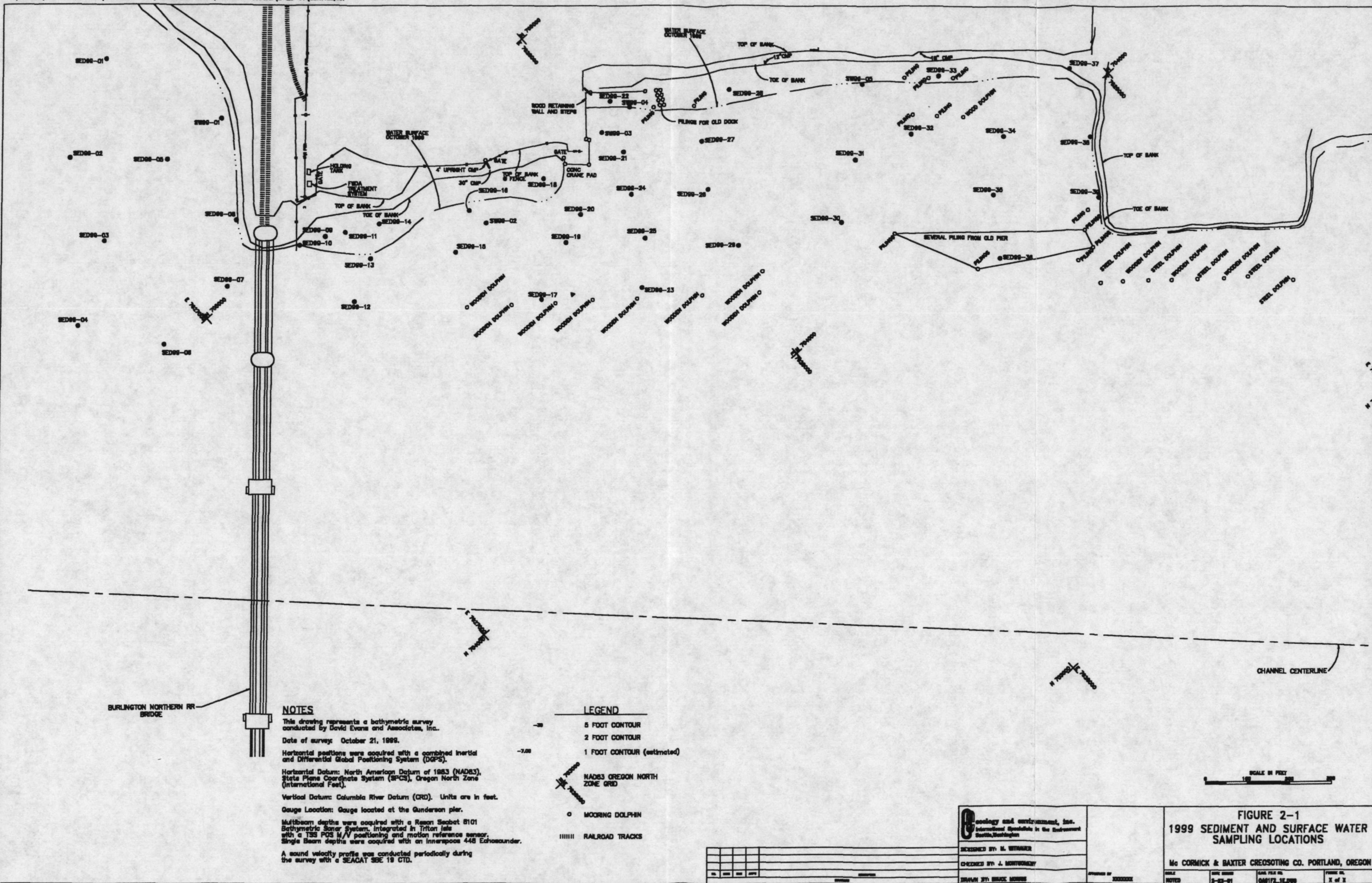
PTS has not finalized the NAPL physical testing results. Upon receipt of the results from PTS, E & E will submit them in a technical memorandum to DEQ.

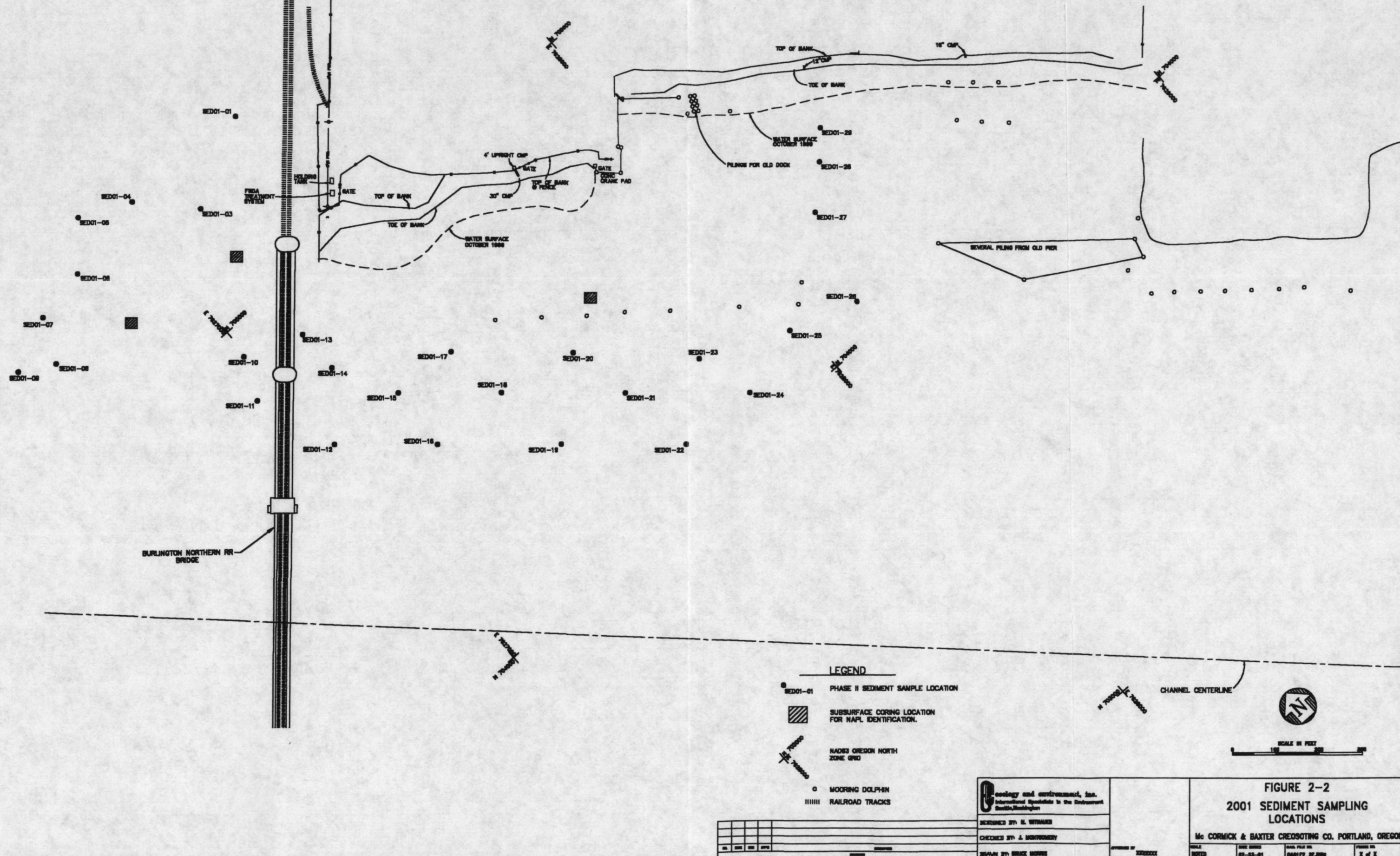
TABLE 2-1
REMEDIAL DESIGN SEDIMENT DESCRIPTIONS
October 1999
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon

Sample Location	Color	Odor	Visible Contamination	Other Description
MBSED99-01	Brown	None	None	No benthic organisms present.
MBSED99-02	Brown	None	None	No benthic organisms present.
MBSED99-03	Brown	None	None	No benthic organisms present.
MBSED99-04	Brown	None	Some oil staining	Some organic matter and one dead mussel.
MBSED99-05	Brown	None	None	No benthic organisms present.
MBSED99-06	Brown	None	None	One live clam present.
MBSED99-07	Dark gray-brown	Petroleum odor	Oil sheen	Wood debris present.
MBSED99-08	Dark gray-brown	Petroleum odor	Oil staining	Wood debris and one live clam present.
MBSED99-09	Brown	None	None	Onshore.
MBSED99-10	Brown	None	None	Onshore.
MBSED99-11	Brown	None	None	Onshore.
MBSED99-12	Dark gray-brown	None	Oil staining	Wood debris present.
MBSED99-13	Brown	None	None	Onshore.
MBSED99-14	Brown	None	None	Onshore.
MBSED99-15	Brown	None	None	No benthic organisms present.
MBSED99-16	Gray-brown	None	Trace oil sheen	No benthic organisms present.
MBSED99-17	Dark gray-brown	Petroleum odor	Heavy oil sheen	Free product in sample.
MBSED99-18	Brown	None	None	Onshore.
MBSED99-19	Gray-brown	None	None	No benthic organisms present.
MBSED99-20	Brown	Petroleum odor	Oil sheen	Wood debris present.
MBSED99-21	Dark gray	None	Trace oil sheen	Wood debris present.
MBSED99-22	Brown	None	None	Onshore.
MBSED99-23	Brown	None	None	No benthic organisms present.
MBSED99-24	Brown	None	None	No benthic organisms present.
MBSED99-25	Brown	None	None	One dead clam present.
MBSED99-26	Brown	None	Trace oil sheen	No benthic organisms present.
MBSED99-27	Brown	None	Trace oil sheen	No benthic organisms present.
MBSED99-28	Brown	None	None	Onshore.
MBSED99-29	Dark gray	None	Trace oil sheen	One live clam present.
MBSED99-30	Dark gray	None	None	No benthic organisms present.
MBSED99-31	Dark gray	None	None	No benthic organisms present.
MBSED99-32	Gray	None	None	Trace organic matter present.
MBSED99-33	Brown	None	None	Onshore.
MBSED99-34	Gray	None	None	Trace organic matter present.
MBSED99-35	Gray	None	None	Trace organic matter present.
MBSED99-36	Gray	None	None	Some organic matter present.
MBSED99-37	Brown	None	None	Onshore.
MBSED99-38	Gray	None	None	Some organic matter present.
MBSED99-39	Gray	None	None	Some organic matter present.

TABLE 2-2
REMEDIAL DESIGN SEDIMENT DESCRIPTIONS
 January 2001
 McCormick & Baxter Creosoting Company
 Portland Plant
 Portland, Oregon

Sample Location	Color	Odor	Visible Contamination	Other Description
MBSED01-01	Dark brown	None	None	No benthic organisms present. Some concrete and cobbles present.
MBSED01-02	Brown	None	Visible sheen and light staining	One clam shell present.
MBSED01-03	Dark brown gray	None	None	No benthic organisms present.
MBSED01-04	Dark gray-brown	None	None	No benthic organisms present.
MBSED01-05	Dark gray	None	None	No benthic organisms present.
MBSED01-06	Dark gray brown	None	None	No benthic organisms present.
MBSED01-07	Dark gray-brown	None	None	No benthic organisms present. Some wooden debris present.
MBSED01-08	Red, brown, dark gray-black	None	None	Lithic sand. No benthic organisms present.
MBSED01-09	Dark gray-brown	None	None	Fine wooden debris present. No benthic organisms present.
MBSED01-10	Dark brown	None	None	No benthic organisms present.
MBSED01-11	Dark gray	None	None	No benthic organisms present.
MBSED01-12	Dark gray to gray	None	Light sheen	A few live clams present. Some concrete rubble present.
MBSED01-13	Dark gray	None	Moderate sheen	No benthic organisms present. Leaves and sticks present.
MBSED01-14	Dark brown	None	None	No benthic organisms present. Sticks present.
MBSED01-15	Brown to black	None	None	No benthic organisms present.
MBSED01-16	Black	None	None	No benthic organisms present.
MBSED01-17	Black	None	None	Fine wooden debris present. No benthic organisms present.
MBSED01-18	Dark gray	None	None	No benthic organisms present.
MBSED01-19	Dark gray to black	None	None	No benthic organisms present.
MBSED01-20	Dark gray	None	None	Fine wooden debris present. No benthic organisms present.
MBSED01-21	Dark gray	None	None	No benthic organisms present.
MBSED01-22	Dark gray	None	None	Fine woody debris present. No benthic organisms present.
MBSED01-23	Dark gray	None	None	No benthic organisms present.
MBSED01-24	Dark gray to black	None	None	No benthic organisms present.
MBSED01-25	Dark gray	None	None	Fine woody debris present. No benthic organisms present.
MBSED01-26	Dark gray	None	Moderate sheen	Fine woody debris present. No benthic organisms present.
MBSED01-27	Gray	None	None	No benthic organisms present.
MBSED01-28	Dark gray	None	None	No benthic organisms present.
MBSED01-29	Gray	None	None	No benthic organisms present.
MBSED01-30	Dark gray	None	None	Midges present. Plant debris present.





3

Analytical Results

This section presents the analytical results from the October 1999 sediment and surface water sampling and the January 2001 sediment sampling. Analytical results from the February 2001 NAPL physical testing and sediment pore water analyses will be presented in a separate memorandum to DEQ.

3.1 Sediment Sampling

3.1.1 Phase I Remedial Design Sediment Sampling

Analytical results from the Phase I sediment sampling are presented in Tables 3-1 through 3-5 and Figures 3-1 through 3-8. Table 3-1 presents sediment chemistry results including carcinogenic PAHs (cPAHs), PCP, arsenic, and dioxin/furan tetrachlorodibenzo-*p*-dioxin (TCDD) toxicity equivalent concentrations. Table 3-2 presents sediment PAH chemistry results. Dioxin/furan TCDD toxicity equivalent concentrations were calculated using recently revised EPA, Region 10, (EPA 2000a) toxicity equivalency factors and analytical results provided by Pace Analytical Services, Inc. Figures 3-1 and 3-2 illustrate total PAH and cPAH concentrations, respectively, for sediment and surface water samples collected at the McCormick & Baxter site. cPAHs include benzo(a)anthracene, B(a)P, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Figure 3-3 illustrates the grain size results for the sediment samples collected at the McCormick & Baxter site.

Sediment bioassay results, including percent survival of *Hyaella azteca* test organisms after a 10-day exposure, and percent survival and growth of *Chironomus tentans* test organisms after a 10-day exposure, are presented in Table 3-3. A discussion of the bioassay results is presented in Section 3.3.3.1. Figure 3-4 illustrates the bioassay results for the sediment samples collected at the McCormick & Baxter site.

cPAHs
carcinogenic PAHs

TCDD
tetrachlorodibenzo-*p*-
dioxin

3. Analytical Results

Sediment grain size results, including percent gravel, sand, and silt/clay, are presented in Table 3-4. Sediment density results are presented in Table 3-5. Field notes describing the sediment samples are summarized in Table 2-1. Figure 3-5 illustrates arsenic concentrations for sediment and surface water samples collected at the McCormick & Baxter site. Figures 3-6, 3-7, and 3-8 illustrate analytical results for the four upstream reference sediment samples.

3.1.2 Phase II Remedial Design Sediment Sampling

Analytical results of the Phase II sediment sampling are presented in Tables 3-6 through 3-8 and Figures 3-9 through 3-13. Table 3-6 presents PAH sediment chemistry results. Figures 3-9 and 3-10 illustrate total PAH and cPAH concentrations, respectively, for the sediment samples collected at the McCormick & Baxter site.

Sediment grain size results, including percent gravel, sand, and silt/clay, are presented in Table 3-7. Field notes describing the sediment samples are summarized in Table 2-2. Figure 3-11 illustrates the grain size results for the sediment samples collected at the McCormick & Baxter site.

Sediment bioassay results, including percent survival of *Hyaella azteca* test organisms after a 10-day exposure, and percent survival and growth of *Chironomus tentans* test organisms after a 10-day exposure, are presented in Table 3-8. A discussion of the bioassay results is presented in Section 3.3.3.2. Figure 3-12 illustrates the bioassay results for the sediment samples collected at the McCormick & Baxter site. Figure 3-13 illustrates analytical results for the upstream reference sediment sample (MBSED01-30).

3.2 Surface Water Sampling

During the Phase I sampling in October 1999, surface water samples from the McCormick & Baxter site were submitted to OAL for analysis of arsenic and semivolatiles, including PAHs and PCP. The surface water sample analytical results are presented in Table 3-9 and illustrated in Figures 3-1, 3-2, and 3-5.

3.3 Evaluation of Analytical Results

Analytical results for sediment (see Table 3-1) were evaluated against the ROD cleanup goals. The current cleanup goals for sediment (see Table 1-1) are designed to prevent direct human contact with sediment contaminated above health-based levels and to prevent exposure of benthic organisms to sediment contaminated above known toxicity levels. No Oregon or federal freshwater sediment quality criteria exist; however, bioassay results in 1991 indicated that a substantial area of near-shore contaminated

3. Analytical Results

sediment is toxic to sedentary benthic invertebrates. This area coincides with areas having contamination exceeding human health risk-based goals. An additional cleanup goal, based on bioassay tests resulting in a mortality rate less than or equal to results from upstream reference locations, was incorporated into the RD objectives in order to protect benthic organisms (see Table 1-1). Section 3.3.3 addresses this issue with a discussion of the relationship between sediment chemistry and sediment bioassay results.

3.3.1 Evaluation of Sediment Analytical Results

3.3.1.1 October 1999 Sediment Analytical Results

In October 1999, sediment samples were collected from 39 site locations and four upstream reference locations and analyzed for total arsenic (by EPA Method 200.9) and semivolatiles (by EPA Method 8270 selective ion monitoring [SIM]), including 17 PAH compounds and PCP. In addition to these analytes, sediment samples collected from 10 site locations were analyzed for dioxin/furan compounds. Grain size analysis (by ASTM Method D422) was performed on all site and upstream reference sediment samples.

Six sediment samples (MBSED99-07, -08, -17, -20, -23, and -29) displayed cPAH results exceeding the ROD cleanup goal of 2,000 micrograms per kilogram ($\mu\text{g/kg}$). These sediment samples were collected in Willamette Cove immediately downstream of the BNRR bridge (MBSED99-07 and -08), southwest of the TFA along the east side of the shipping channel (MBSED99-17, -20, and -23), and above the shipping channel (MBSED99-29; see Figure 3-2). Sediment sample MBSED99-17, collected at the bottom of the slope, contained the highest cPAH concentration, 22,560 $\mu\text{g/kg}$. No ROD cleanup goals for PCP, arsenic, or dioxins/furans (see Table 3-1) were exceeded in the sediment samples collected in October 1999 at the McCormick & Baxter site.

cPAHs were detected in two of the four reference sediment samples (MBSED99-40 and -42) at low concentrations (53 $\mu\text{g/kg}$ and 137 $\mu\text{g/kg}$, respectively). PCP was not detected in the reference sediment samples. Arsenic was detected at concentrations ranging from 3,000 $\mu\text{g/kg}$ to 4,100 $\mu\text{g/kg}$ in the reference sediment samples.

LPAH to high-molecular-weight PAH (HPAH) concentration ratios were calculated for surface sediment samples to evaluate the characteristics of the contaminant sources. PTI (1992a) listed ranges of LPAH/HPAH ratios for creosote (2.1 to 6.1) and diesel (0.81 to 5.2). Samples exhibiting LPAH/HPAH ratios listed within

SIM
selective ion monitoring

$\mu\text{g/kg}$
micrograms per kilogram

HPAH
high-molecular-weight
PAH



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the range of ratios for creosote include samples collected at the bottom of the slope (MBSED99-17; ratio of 2.8), immediately downstream of the BNNR bridge (MBSED99-08; ratio of 3.8), and near the former creosote dock (MBSED99-12; ratio of 2.7). Samples exhibiting LPAH/HPAH ratios within the range of ratios listed for diesel include those samples listed for creosote and two upstream locations (MBSED99-41 and -43; ratio of 1.0). Further evaluation is needed before the contaminant sources at these locations can be attributed to historical creosote or diesel spills or the migration of PAHs through groundwater seeps.

3.3.1.2 January 2001 Sediment Analytical Results

In January 2001, surface sediment samples were collected from 29 site locations and one upstream reference location for analysis for semivolatiles (by EPA Method 8270 SIM), including 17 PAH compounds and PCP. Grain size analysis (by ASTM Method D422) was performed on all of the site and upstream reference sediment samples.

Five sediment samples (MBSED01-07, -13, -17, -28, and -29) displayed cPAH results exceeding the ROD cleanup goal of 2,000 $\mu\text{g/kg}$. These sediment samples were collected in Willamette Cove downstream of the BNNR bridge (MBSED01-07), immediately upstream of the BNNR bridge along the east side of the shipping channel (MBSED01-13), west of the TFA along the east side of the shipping channel (MBSED01-17), and southwest of the TFA in the lagoon (MBSED01-28 and -29; see Figure 3-10). Sediment sample MBSED99-13, collected at the bottom of the slope, contained the highest cPAH concentration, 17,147 $\mu\text{g/kg}$. PAHs were not detected in the reference sediment sample (MBSED01-30).

3.3.2 Evaluation of Surface Water Analytical Results

To obtain information about the contaminant flux from sediment to surface water, five surface water samples were collected at the McCormick & Baxter site in October 1999 (see Figure 2-1). Four of the five surface water sample locations (MBSW99-01, -02, -04, and -05) were chosen because prior sediment sampling showed the highest concentrations of PAHs and PCP. The fifth sample (MBSW99-03) was collected at a location where LNAPL has been observed coming to the surface.

The surface water samples were analyzed for semivolatiles, including PAHs and PCP (by EPA Method 8270 SIM), and for arsenic (by EPA Method 200.9). cPAHs, PCP, and arsenic were not detected in any of the five surface water samples collected at the McCormick & Baxter site (see Table 3-9). LPAHs, including



3. Analytical Results

naphthalene, acenaphthene, fluorene, phenanthrene, and fluoranthene, and an HPAH, pyrene, were detected in the surface water samples. During times of low tide in mid-October 1999, LNAPL was observed coming to the surface near the shore downgradient of the TFA. The source of the detected PAHs could be related to the visible LNAPL seeps.

Surface water results also were compared to applicable AWQC to determine whether detected concentrations of PAHs exceeded the AWQC. Freshwater AWQC, listed by DEQ (2000) for the protection of aquatic life, are available for the following PAHs: naphthalene (620 micrograms per liter [$\mu\text{g/L}$], chronic criteria), acenaphthalene (520 $\mu\text{g/L}$, chronic criteria), and fluoranthene (3,980 $\mu\text{g/L}$, acute criteria). Acenaphthalene was not detected in any of the surface water samples. The maximum detected concentrations of naphthalene (1.1 $\mu\text{g/L}$ at MBSW99-05) and fluoranthene (0.4 $\mu\text{g/L}$ at MBSW99-04) were well below their respective AWQC.

$\mu\text{g/L}$
micrograms per liter

mg/L
milligrams per liter

3.3.3 Evaluation of Sediment Bioassay Results

This section provides a brief discussion of the results of the sediment bioassays in relationship to the chemistry results. Bioassay test methods included 10-day percent survival of amphipod (*Hyaella azteca*) test organisms and 10-day percent survival and growth of larval midges (*Chironomus tentans*) test organisms.

3.3.3.1 Phase I Sediment Bioassay Results

In October 1999, bioassay testing was performed in accordance with ASTM Method E 1706-95b, *Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates*, on all site and upstream reference sediment samples. *Chironomus tentans* exhibited significant mortality in one sediment sample collected at the McCormick & Baxter site (MBSED99-17, 2.5% survival) and in one upstream reference sample (MBSED99-40, 62.5% survival). Analytical results for MBSED99-17 displayed an elevated concentration of total PAHs, 385,290 $\mu\text{g/kg}$. Although MBSED99-40 did not display elevated concentrations of analytes listed in the ROD cleanup goals, this sample did display the highest initial concentration of ammonia (2.37 milligrams per liter [mg/L] as $\text{NH}_3\text{-N}$) of the 42 sediment samples evaluated. Other than MBSED99-17 (2.04 mg/L of $\text{NH}_3\text{-N}$), all other sediment samples displayed ammonia results of less than 2 mg/L . Therefore, the *Chironomus tentans* test organisms likely are more sensitive to elevated levels of ammonia than to PAHs. *Hyaella azteca* test organisms did not display sensitivity to ammonia.



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Because the *Chironomus tentans* results showed little toxicity or reduction in growth, the following discussion is limited to the results of the *Hyaella azteca* bioassays. Also, because the arsenic, PCP, and dioxin/furan sediment chemistry results were generally low or nondetect, only PAH results are considered.

The sediment cleanup goals for PAHs presented in the ROD are based on unacceptable human health risks associated with exposure to cPAHs and significant mortality to bioassay test organisms. Although cPAHs contribute to sediment toxicity, the lighter-weight PAHs typically are more acutely toxic to benthic organisms. Consequently, PAH concentrations in sediment were evaluated based on total PAH concentrations, total LPAH concentrations, and total HPAH concentrations. For the purpose of this evaluation, all PAHs with a molecular weight less than that of pyrene were considered to be LPAHs, and the remainder were considered to be HPAHs. This breakdown grouped all two- and three-ring PAHs together as LPAHs, and all PAHs of four or more rings as HPAHs. All of the cPAHs were classified as HPAHs.

Figures 3-14 and 3-15 illustrate the relationship between total PAH concentrations and bioassay results and LPAH concentrations and bioassay results, respectively. Stations with significant mortality compared to the laboratory control sample are highlighted in red, and locations where mortality was not significantly different from that of the laboratory control sample are displayed in green.

Although total PAHs and LPAHs appear to be correlated with sediment toxicity, significant mortality was found at some stations with low PAH concentrations, and low mortality was observed in one sample with high PAH concentrations.

In general, there was a slightly stronger relationship between LPAH concentrations and mortality than between total PAH (or HPAH) concentrations and mortality. This is consistent with the usual results of bioassays, which generally indicate that LPAHs are more acutely toxic. An example of these results can be seen in samples MBSED99-07 and -20:

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Sample	Total PAH Concentration (mg/kg)	LPAH Concentration (mg/kg)	Fraction of PAHs as LPAHs (%)	<i>Hyaella</i> <i>azteca</i> Survival (%)
MBSED99-07	32.6	20.2	61.9	27.5
MBSED99-20	35.5	14.0	39.5	86.3

Key:

mg/kg = Milligrams per kilogram.

These two samples have approximately the same concentration of total PAHs, but significantly more of the PAHs are present as LPAHs in sample MBSED99-07, which also showed significantly higher mortality in the bioassays. Sample MBSED99-20 had the second highest concentration of total cPAHs of any of the samples but showed no increased *Hyaella azteca* mortality. Significantly decreased *Chironomus tentans* weight was associated with this sample.

ER-Ls
effects range-lows

ER-Ms
effects range-mediums

Vertical lines on Figures 3-14 and 3-15 indicate sediment benchmark concentrations for total PAHs and LPAHs. NOAA effects range-lows (ER-Ls) and effects range-mediums (ER-Ms), listed by Long et al. (1995), are shown in each illustration. The individual PAHs used to derive the ER-Ls and ER-Ms do not match the analytes from this sampling event exactly, so these comparisons are approximate. As indicated in these illustrations, significant mortality is seen in several samples with total PAH and LPAH concentrations below ER-Ls (4,022 $\mu\text{g/kg}$ and 552 $\mu\text{g/kg}$, respectively), which are calculated as lower-10th-percentile effects concentrations. This implies that effects are seen in site sediments at lower concentrations than would be typical for PAH contamination. Sediment sample total PAH and LPAH concentrations also were compared to the ER-Ms (44,792 $\mu\text{g/kg}$ and 3,160 $\mu\text{g/kg}$, respectively), which are calculated as the 50th-percentile effects concentrations.

Also shown in Figures 3-9 and 3-10 are vertical lines corresponding approximately to the highest reliability in the data set and the concentration associated with a sensitivity of 80% (i.e., no more than 20% of the toxic stations are reported incorrectly). The point of highest reliability is the value at which the bioassay results are most frequently predicted correctly, whether these results indicate toxicity or a lack of toxicity. Despite the high overall reliability, about half of the total PAH and LPAH concentrations associated with significant mortality fall below this concentration.



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The concentrations associated with a sensitivity of 80% represent a more protective level at which it is unlikely that significant toxic effects would be missed. The drawback to this level is that a significant amount of results with no toxicity falls above these concentrations, which are nearly an order of magnitude lower than the ER-Ls for total PAHs and LPAHs. Consequently, the overall reliability of this value is much lower.

Based on this evaluation of the bioassay results, the following general conclusions can be made:

- ▲ The existing cleanup goal for cPAHs is a poor indicator of benthic toxicity. Two of the six samples with cPAH concentrations exceeding the cleanup goal exhibited no significant toxicity, while six other stations with cPAH concentrations below the cleanup goal had significantly higher mortality than the control;
- ▲ LPAHs seem to be a better indicator of benthic toxicity, but a cleanup goal for LPAHs derived from the bioassays likely would be very low (i.e., less than 1 milligram per kilogram [mg/kg]), even at median or "highest-reliability" levels. A cleanup goal based on a target of 80% sensitivity would be even lower (about 0.13 mg/kg of LPAHs); and
- ▲ Because several samples with low PAH concentrations exhibited significant *Hyaella azteca* mortality, other chemicals present in the sediment likely are affected the results of the bioassays. These chemicals may or may not be related to the site. Because the scope of the RD is limited to site-related contaminants, including arsenic, PCP, dioxins/furans, and PAHs, further analysis for additional chemicals was not performed.

mg/kg
milligram per kilogram

3.3.3.2 Phase II Sampling Bioassay Results

In January 2001, bioassay testing was performed on 17 sediment samples collected near the McCormick & Baxter site and the upstream reference sediment sample (MBSED01-30). The toxicity tests were conducted in accordance with *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates* (EPA 2000b).

Hyaella azteca exhibited significant mortality in two sediment samples collected near the McCormick & Baxter site, MBSED01-07 (28.8% survival) and -29 (8.8% survival), with respect to the laboratory controls and the upstream reference sample. No other



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sediment samples exhibited significant mortality to *Hyaella azteca* test organisms. Sediment samples MBSED01-07 and -29 also contained the highest total PAH and LPAH concentrations.

Chironomus tentans also exhibited significant mortality in sediment samples MBSED01-07 (12.5% survival) and 29 (0% survival), with respect to the laboratory controls and the upstream reference sample. *Chironomus tentans* also exhibited impaired growth in sediment samples MBSED01-07 and -26 (0.30 milligram [mg] of growth and 0.62 mg of growth, respectively), with respect to the laboratory controls (1.39 mg of growth and 0.62 mg of growth, respectively). The basis of design for the sediment cap includes only significant mortality results because factors other than toxicity alone, such as physical characteristics of the sediment, may affect growth.

mg
milligram

3.4 Quality Assurance/Quality Control

The October 1999 sampling event was conducted in accordance with the sampling protocol set forth in E & E's SQAP dated August 1999. The January 2001 sampling event was conducted in accordance with the procedures outlined in *Final Sediment Remedial Design, Sampling and Quality Assurance Plan Amendment* (E & E 2000b).

3.4.1 Analytical Data

3.4.1.1 Phase I Remedial Design Sampling, October 1999

All Phase I RD sediment and surface water samples were submitted to OAL for analysis of PAHs, PCP, and arsenic. OAL distributed the sediment samples to subcontracted laboratories for analysis of grain size and toxicity testing. Selected sediment samples were submitted for dioxin/furan analysis, also to a laboratory subcontracted to OAL.

3.4.1.2 Phase II Remedial Design Sampling, January 2001

All Phase II RD sediment samples were submitted to NCA for analysis of PAHs. NCA distributed some sediment samples to a subcontracted laboratory for analysis of grain size. Selected sediment samples were submitted to MEC for toxicity testing.

3.4.2 Blind Field Duplicate Samples

3.4.2.1 Phase I Remedial Design Sampling, October 1999

To provide an indication of overall sample variability, five blind duplicate sediment samples and one blind duplicate surface water sample were collected during Phase I RD field activities and analyzed to determine field and laboratory variability. Duplicate sediment samples were collected at four McCormick & Baxter site locations (MBSED99-33, -16, -26, and -09), and one duplicate sediment sample was collected at an upstream reference location (MBSED99-40). One duplicate surface water sample was collected at location MBSW99-04 and was labeled *MBSW99-07*.

RPDs
relative percent
differences

All relative percent differences (RPDs) for sediment arsenic and PCP results were below 25%, indicating that variability due to field sampling procedures was minimal. Three of the five blind duplicate sediment samples had RPDs for cPAH concentrations greater than 25%: MBSED99-33 (58% RPD), -26 (66% RPD), and -09 (70% RPD). Arsenic, PCP, and cPAHs were not detected in MBSW99-04 or its field duplicate. LPAHs were detected in these surface water samples. The RPD between total PAHs in MBSW99-04 and its field duplicate was 37%.

3.4.3.2 Phase II Remedial Design Sampling, January 2001

To provide an indication of overall sample variability, three blind duplicate sediment samples were collected during the Phase II RD field activities and analyzed to determine field and laboratory variability. Duplicate sediment samples were collected at McCormick & Baxter site locations (MBSED01-03, -13, and -23).

Two of the three blind duplicate sediment samples had RPDs for cPAH concentrations greater than 25%: MBSED01-03 (46% RPD) and -26 (30% RPD). MBSED01-13 had an RPD for cPAH concentrations of 20%.

3.4.3 Equipment Rinsate Blank

3.4.3.1 Phase I Sampling, October 1999

Three equipment rinsate blanks were submitted to the laboratory for analysis. They were collected to ensure that field cross-contamination due to incomplete decontamination procedures would not occur. Two rinsate blanks (MBSW99-06 and -09) were prepared by rinsing the decontaminated Van Veen sampler with carbon-free deionized water, collecting the rinsates, and filling the

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required container. No cPAH, PCP, or arsenic concentrations were detected in these rinsate blanks. LPAHs were detected at low concentrations (0.2 µg/L to 0.6 µg/L) in MBSW99-06. One rinsate blank (MBSW99-08) was collected by rinsing the decontaminated Van Dorn bottle with carbon-free deionized water, collecting the rinsate, and filling the required container. No PAH, PCP, or arsenic concentrations were detected in this rinsate blank.

3.4.3.2 Phase II Sampling, January 2001

Equipment rinsate blanks were not collected during the Phase II sampling event in January 2001. All field equipment was dedicated for each sample to ensure that cross-contamination would not occur.

3.4.4 Analytical Data Quality Control

All analytical data collected during the sampling activities, including Phase I activities in October 1999 and Phase II activities in January 2001, were evaluated for precision, accuracy, and completeness. The numbers and types (e.g., blank, duplicate, and matrix spike samples) of internal QC checks and samples were determined by the laboratory and applicable methodology.

As requested by DEQ, 10% of the sediment chemistry data were evaluated for precision, accuracy, and completeness. Data validation followed procedures outlined in the following EPA documents:

- ▲ *EPA Region 10 SOP for the Validation of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data* (EPA 1996);
- ▲ *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1994a); and
- ▲ *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 1994b).

It is assumed that precision and accuracy goals for the methods were met by the laboratory for the remaining 90% of the data, and that the data presented in the data packages are acceptable except where estimated concentrations are noted (see Appendix C, "Data Validation Memoranda").

3.4.5 Freshwater Bioassays Data Quality Control

QA/QC requirements for the bioassay testing listed in *Dredged Material Evaluation Framework, Lower Columbia River Manage-*



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ment Area, (USACE et al. 1998) were specified as performance standards during the RD sediment testing.

3.4.5.1 Phase I Sampling, October 1999

Acute sediment tests were performed according to "Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates" (ASTM 1995; see Appendix D). The performance standard of 20% absolute mean mortality was met for the *Hyaella azteca* control samples. The performance standard of 30% absolute mean mortality and a growth performance standard of 0.6 mg minimum mean weight per organism were met for the *Chironomus tentans* control samples. Reference toxicant tests (cadmium for *Hyaella azteca* and potassium chloride for *Chironomus tentans*) indicated that the test organisms were within their expected sensitivity range (see Appendix D for CH2M Hill's bioassay report).

C
Celsius

E & E performed a data QA review of the bioassay data provided by CH2M Hill (see Appendix C, "Data Validation Memoranda"). The sediment samples were received by CH2M Hill at 7° Celsius (C) to 14°C, all greater than the recommended temperature of 4°C±2°C. All samples were qualified as estimated quantities (J) based on these outliers. All other QC criteria were met.

3.4.5.2 Phase II Sampling, January 2001

Acute sediment tests were performed according to *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates* (EPA 2000b; see Appendix D). The performance standard of 20% absolute mean mortality was met for the *Hyaella azteca* control samples. The performance standard of 30% absolute mean mortality and a growth performance standard of 0.6 mg minimum mean weight per organism were met for the *Chironomus tentans* control samples. Reference toxicant tests (cadmium for *Hyaella azteca* and potassium chloride for *Chironomus tentans*) indicated that the test organisms were within their expected sensitivity range (see Appendix D for MEC's bioassay report).

E & E performed a data QA review of the bioassay data provided by MEC (see Appendix C, "Data Validation Memoranda"). All QC criteria were met. No sample results were qualified.

TABLE 3-1
REMEDIAL DESIGN SEDIMENT ANALYTICAL RESULTS
October 1999
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon
(µg/kg)

Sample Identification	Sample Depth (ft)	Carcinogenic PAHs	Arsenic	Dioxin/Furan TCDD Toxicity Equivalent	Pentachlorophenol
MBSED99-01	18.4	141	6,100	NA	60 U
MBSED99-02	31.5	54	5,000	NA	60 U
MBSED99-03	25.4	73	4,700	NA	60 U
MBSED99-04	40.1	1,780	3,900	NA	600 U
MBSED99-05	10.2	252	5,300	0.0011 J	60 U
MBSED99-06	48.4	10 U	2,900	NA	60 U
MBSED99-07	26.4	3,735	6,000	NA	600 U
MBSED99-08	3.1	6,300	3,500	NA	6,000 U
MBSED99-09	0.0	27	3,700	NA	60 U
MBSED99-10	0.0	391	3,400	NA	60 U
MBSED99-11	0.0	99	4,600	0.007 J	60 U
MBSED99-12	34.9	1,662	3,500	NA	60 U
MBSED99-13	0.0	749	4,300	NA	60 U
MBSED99-14	0.0	164	3,200	0.0052 J	60 U
MBSED99-15	34.8	211	4,700	NA	100 U
MBSED99-16	5.2	1,504	8,100	0.15	86
MBSED99-17	40.6	22,560	6,100	NA	6,000 U
MBSED99-18	0.0	99	7,000	0.068 J	60 U
MBSED99-19	0.0	156	3,900	0.0014 J	60 U
MBSED99-20	5.3	6,335	4,400	NA	60 U
MBSED99-21	9.3	935	5,700	0.053 J	68
MBSED99-22	0.0	220	7,700	0.06 J	60 U
MBSED99-23	36.9	2,215	4,300	NA	60 U
MBSED99-24	6.0	429	4,200	NA	60 U
MBSED99-25	4.4	747	4,700	0.011 J	60 U
MBSED99-26	7.0	107	4,800	NA	60 U
MBSED99-27	9.8	542	5,600	NA	100 U
MBSED99-28	0.0	65	4,700	NA	60 U
MBSED99-29	5.4	2,186	5,000	NA	60 U
MBSED99-30	9.9	188	4,900	NA	60 U
MBSED99-31	8.4	85	4,600	NA	60 U
MBSED99-32	7.5	197	5,600	NA	60 U
MBSED99-33	0.0	75	11,700	0.222 J	60 U
MBSED99-34	8.9	438	5,900	NA	60 U

TABLE 3-1
REMEDIAL DESIGN SEDIMENT ANALYTICAL RESULTS
October 1999
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon
(µg/kg)

Sample Identification	Sample Depth (ft)	Carcinogenic PAHs	Arsenic	Dioxin/Furan TCDD Toxicity Equivalent	Pentachlorophenol
MBSED99-35	4.1	86	4,300	NA	60 U
MBSED99-36	35.9	10 U	4,000	NA	60 U
MBSED99-37	0.0	31	7,800	0.03 J	60 U
MBSED99-38	9.0	96	5,700	NA	60 U
MBSED99-39	4.8	123	4,000	NA	60 U
MBSED99-40	8.5	53	4,100	NA	60 U
MBSED99-41	3.5	10 U	3,300	NA	60 U
MBSED99-42	9.2	137	3,500	NA	60 U
MBSED99-43	5.1	10 U	3,000	NA	60 U
MBSED99-50 (Duplicate of MBSED99-33)	0.0	136	11,100	0.16 J	60 U
MBSED99-51 (Duplicate of MBSED99-16)	6.2	1,369	8,900	NA	96
MBSED99-52 (Duplicate of MBSED99-26)	7.0	54	4,100	NA	60 U
MBSED99-53 (Duplicate of MBSED99-09)	0.0	13	3,000	NA	60 U
MBSED99-54 (Duplicate of MBSED99-40)	8.5	56	3,400	NA	60 U

Shaded cells indicate contaminant concentration exceeding the ROD cleanup goals for sediment.

Reference locations include MBSED99-40, -41, -42, and -43.

Carcinogenic PAHs include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

Key:

ft = Feet.

J = The associated numerical value is an estimated quantity because the reported concentrations were less than the contract-required detection limits or because quality control criteria limits were not met.

µg/kg = Microgram per kilogram.

NA = Not available. Analytical test not performed on this sample.

PAHs = Polynuclear aromatic hydrocarbons.

ROD = Record of Decision.

TCDD = Tetrachloro-dibenzo-*p*-dioxin.

U = The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

ROD Cleanup Goals

Arsenic = 12,000 µg/kg.

Pentachlorophenol = 100,000 µg/kg.

Carcinogenic PAHs = 2,000 µg/kg.

Dioxins/furans = 8 µg/kg.

TABLE 3-2
REMEDIAL DESIGN SEDIMENT PAH ANALYTICAL RESULTS
 October 1999
 McCormick & Baxter Creosoting Company
 Portland Plant
 Portland, Oregon
 (µg/kg)

Sample Identification	cPAHs	HPAHs	LPAHs	Total PAHs	LPAH/HPAH
MBSED99-01	141	234	16	250	0.1
MBSED99-02	54	97	10	97	0.1
MBSED99-03	73	135	14	149	0.1
MBSED99-04	1,780	6,050	10,513	16,563	1.7
MBSED99-05	252	491	72	563	0.1
MBSED99-06	10 U	33	10	33	0.3
MBSED99-07	3,735	12,439	20,186	32,625	1.6
MBSED99-08	6,300	34,200	130,400	164,600	3.8
MBSED99-09	27	57	10	57	0.2
MBSED99-10	391	977	418	1,395	0.4
MBSED99-11	99	200	11	211	0.1
MBSED99-12	1,662	7,088	18,934	26,022	2.7
MBSED99-13	749	1,484	540	2,024	0.4
MBSED99-14	164	302	35	337	0.1
MBSED99-15	211	449	132	581	0.3
MBSED99-16	1,504	3,742	702	4,530	0.2
MBSED99-17	22,560	102,460	282,830	385,290	2.8
MBSED99-18	99	144	10	144	0.1
MBSED99-19	156	416	80	496	0.2
MBSED99-20	6,335	21,496	14,040	35,536	0.7
MBSED99-21	935	1,678	550	2,296	0.3
MBSED99-22	220	319	26	345	0.1
MBSED99-23	2,215	5,203	804	6,007	0.2
MBSED99-24	429	732	131	863	0.2
MBSED99-25	747	1,042	201	1,243	0.2
MBSED99-26	107	185	31	216	0.2
MBSED99-27	542	1,128	309	1,437	0.3
MBSED99-28	65	94	10	94	0.1
MBSED99-29	2,186	3,704	798	4,502	0.2
MBSED99-30	188	347	68	415	0.2
MBSED99-31	85	179	31	210	0.2
MBSED99-32	197	396	70	466	0.2
MBSED99-33	75	111	10	111	0.1
MBSED99-34	438	1,273	152	1,425	0.1

TABLE 3-2
REMEDIAL DESIGN SEDIMENT PAH ANALYTICAL RESULTS
 October 1999
 McCormick & Baxter Creosoting Company
 Portland Plant
 Portland, Oregon
 (µg/kg)

Sample Identification	cPAHs	HPAHs	LPAHs	Total PAHs	LPAH/HPAH
MBSED99-35	86	208	261	469	1.3
MBSED99-36	10 U	10	10	10	1.0
MBSED99-37	31	62	10	62	0.2
MBSED99-38	96	178	17	195	0.1
MBSED99-39	123	204	19	223	0.1
MBSED99-40	53	91	10	91	0.1
MBSED99-41	10 U	10	10	376	1.0
MBSED99-42	137	305	71	341	0.2
MBSED99-43	10 U	10	10	3,263	1.0
MBSED99-50 (Duplicate of MBSED99-33)	136	249	92	122	0.4
MBSED99-51 (Duplicate of MBSED99-16)	1,369	2,494	673	36	0.3
MBSED99-52 (Duplicate of MBSED99-26)	54	108	14	119	0.1
MBSED99-53 (Duplicate of MBSED99-09)	13	36	10	46	0.3
MBSED99-54 (Duplicate of MBSED99-40)	56	108	11	119	0.1

Shaded cells indicate contaminant concentration exceeding the ROD cleanup goal for sediment.

Reference locations include MBSED99-40, -41, -42, and -43.

Key:

cPAHs = Carcinogenic PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, pyrene, fluoranthene, and indeno(1,2,3-cd)pyrene.

HPAHs = High-molecular-weight PAHs including fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

LPAHs = Light-molecular-weight PAHs including: naphthalene, acenaphthalene, acenaphthene, fluorene, phenanthrene, and anthracene.

µg/kg = Microgram per kilogram.

NA = Not available. Analytical test not performed on this sample.

PAHs = Polynuclear aromatic hydrocarbons.

ROD = Record of Decision.

U = The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

ROD Cleanup Goal

cPAHs = 2,000 µg/kg.

TABLE 3-3
REMEDIAL DESIGN SEDIMENT BIOASSAY RESULTS
October 1999
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon

Sample Identification	<i>Hyalella azteca</i>	<i>Chironomus tentans</i>	
	Percent Survival	Percent Survival	Weight (mg)
MBSED99-01	91.3 J	78.8 J	1.40 J
MBSED99-02	95 J	78.8 J	1.55 J
MBSED99-03	71.3 J	76.3 J	1.40 J
MBSED99-04	35.0 J	82.5 J	1.34 J
MBSED99-05	75.0 J	81.3 J	1.46 J
MBSED99-06	82.5 J	86.3 J	1.78 J
MBSED99-07	27.5 J	85.0 J	0.92 J
MBSED99-08	0 J	85.0 J	1.19 J
MBSED99-09	88.8 J	78.8 J	1.35 J
MBSED99-10	96.3 J	83.8 J	1.12 J
MBSED99-11	93.8 J	88.8 J	1.12 J
MBSED99-12	47.5 J	92.5 J	1.69 J
MBSED99-13	95.0 J	87.5 J	0.26 J
MBSED99-14	86.3 J	88.8 J	1.28 J
MBSED99-15	55 J	92.5 J	1.67 J
MBSED99-16	92.5 J	95.0 J	1.21 J
MBSED99-17	0 J	2.5 J	0.01 J
MBSED99-18	96.3 J	95.0 J	1.47 J
MBSED99-19	96.3 J	91.3 J	1.68 J
MBSED99-20	86.3 J	73.8 J	0.31 J
MBSED99-21	96.3 J	76.3 J	0.96 J
MBSED99-22	77.5 J	88.8 J	1.17 J
MBSED99-23	98.8 J	70.0 J	1.08 J
MBSED99-24	72.5 J	86.3 J	1.90 J
MBSED99-25	91.3 J	85.0 J	1.84 J
MBSED99-26	70.0 J	90.0 J	1.87 J
MBSED99-27	61.3 J	95.0 J	1.88 J
MBSED99-28	71.3 J	88.8 J	1.22 J
MBSED99-29	63.8 J	81.3 J	1.85 J
MBSED99-30	85 J	92.5 J	1.78 J
MBSED99-31	72.5 J	85.0 J	1.82 J
MBSED99-32	86.3 J	90.0 J	1.46 J
MBSED99-33	82.5 J	90.0 J	1.50 J
MBSED99-34	91.3 J	85 J	1.06 J
MBSED99-35	87.5 J	88.8 J	1.28 J
MBSED99-36	92.5 J	91.3 J	1.26 J

TABLE 3-3
REMEDIAL DESIGN SEDIMENT BIOASSAY RESULTS
October 1999
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon

Sample Identification	<i>Hyaella azteca</i>	<i>Chironomus tentans</i>	
	Percent Survival	Percent Survival	Weight (mg)
MBSED99-37	82.5 J	91.3 J	1.15 J
MBSED99-38	87.5 J	93.8 J	1.04 J
MBSED99-39	97.5 J	88.8 J	1.23 J
MBSED99-40	97.5 J	62.5 J	1.20 J
MBSED99-41	91.3 J	76.3 J	1.28 J
MBSED99-42	98.8 J	68.8 J	1.19 J
MBSED99-43	97.5 J	85.0 J	1.56 J
Laboratory Control (10/19/99)	NA	76.9	1.26
Laboratory Control (11/1/99)	86.3	NA	NA
Sediment Control (11/1/99)	96.3	NA	NA
Laboratory Control (11/2/99)	NA	79.4	1.05
Sediment Control (11/9/99)	81.3	NA	NA
Laboratory Control (11/9/99)	83.8	NA	NA

Shaded cells indicate a statistically significant reduction from laboratory control at $p < 0.05$ using Wilcoxon two-sample test.

Reference locations include MBSED99-40, -41, -42, and -43.

Key:

J = The associated numerical value is an estimate because quality control criteria was not met.

mg = milligrams.

NA = Not available. Results shown are only for bioassay test.

TABLE 3-4
REMEDIAL DESIGN SEDIMENT GRAIN SIZE RESULTS
McCormick & Baxter Creosoting Company Site
Portland, Oregon
October 1999

Seive Size	Cobble	Coarse Gravel			Fine Gravel		% Gravel	Coarse Sand	Medium Sand			Fine Sand					% Sand	#200	% Silt / Clay
	3"	2"	1-1/2"	1"	3/4"	3/8"		#4	#10	#20	#30	#40	#60	#80	#100	#140			
Sample ID	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing		% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing		% Passing		
MBSED99-01	99.67	99.67	99.67	99.67	99.67	99.67	0.33	99.67	99.65	98.46	96.54	85	85	80.38	1.99	49.23	87.36	12.31	12.31
MBSED99-02	99.85	99.85	99.85	99.85	99.85	99.85	0.15	99.85	99.85	97.1	96.23	90.43	90.43	85.8	2.88	48.7	85.07	14.78	14.78
MBSED99-03	99.79	99.79	99.79	99.79	99.79	99.79	0.21	99.79	99.79	107.87	106.74	100	100	94.38	2.12	42.7	82.94	16.85	16.85
MBSED99-04	99.57	99.57	99.57	99.57	99.57	98.92	1.66	98.34	97.68	93.55	81.57	18.43	18.43	15.1	2.07	7.73	97.21	1.13	1.13
MBSED99-05	98.97	98.97	98.97	98.97	97.1	94.81	8.02	91.98	89.95	97.29	89.26	11.49	11.49	5.71	1.72	1.33	91.98	0	0
MBSED99-06	98.2	98.2	98.2	98.2	98.2	96.82	5.96	94.04	91.32	95.65	87.96	28.17	28.17	19.06	5.9	5.59	93.22	0.82	0.82
MBSED99-07	98.56	98.56	98.56	98.56	98.56	97.74	4.58	95.42	93.17	91.23	75.82	9.9	9.9	5.99	1.78	1.91	95.24	0.18	0.18
MBSED99-08	99.25	99.25	99.25	99.25	99.25	99.12	1.36	98.64	98.07	107.65	105.73	53.7	53.7	35.46	4.13	18.05	89.62	9.02	9.02
MBSED99-09	99.92	87.62	87.62	87.62	86.6	83.89	19.37	80.63	78.48	96.66	91.61	17.56	17.56	5.17	0.99	0.46	80.55	0.08	0.08
MBSED99-10	82.88	82.88	82.88	82.88	82.72	81.24	20.84	79.16	76.95	93.07	82.91	12.5	12.5	4.61	0.91	0.53	79.07	0.09	0.09
MBSED99-11	87.74	87.74	87.74	87.74	87.74	81.16	35.13	64.87	45.47	62.19	45.73	6.81	6.81	2.32	0.74	0.23	64.81	0.06	0.06
MBSED99-12	99.89	99.89	99.89	99.89	99.89	99.85	0.98	99.02	96.74	91.32	77.45	21.73	21.73	18.44	10.43	5.97	97.41	1.61	1.61
MBSED99-13	99.97	96.65	96.65	87.21	84.85	74.31	34.65	65.35	58.56	81.59	66.7	5.63	5.63	2.02	0.64	0.38	65.27	0.08	0.08
MBSED99-14	99.79	99.79	99.79	96.94	91.51	70.2	46.31	53.69	41.01	69.79	57.81	9.49	9.49	2.19	0.46	0.19	53.63	0.06	0.06
MBSED99-15	99.63	99.63	99.63	99.63	99.63	99.63	0.37	99.63	99.49	92.23	91.52	90.03	90.03	84.2	10.85	38.33	86.83	12.8	12.8
MBSED99-16	99.67	99.67	99.67	99.67	99.67	99.61	0.54	99.46	98.98	99.14	97.4	74.81	74.81	64.95	20.22	11.45	95.26	4.2	4.2
MBSED99-17	99.51	99.51	99.51	99.51	91.27	84.92	20.46	79.54	72.68	90.53	83.36	54.26	54.26	47.1	10.01	13.22	76.05	3.49	3.49
MBSED99-18	99.48	99.48	99.48	99.48	99.48	98.59	2.62	97.38	97.1	86.32	59.37	7.85	7.85	2.44	0.36	0.08	97.38	0	0
MBSED99-19	99.84	99.84	99.84	99.84	98.39	81.44	26.95	73.05	71.17	94.69	82.62	13.51	13.51	8.4	2.78	1.64	72.67	0.38	0.38
MBSED99-20	99.49	99.49	99.49	99.49	98.76	97.3	4.21	95.79	93.31	98.72	97.48	84.41	84.41	76.12	21.7	20.29	90.06	5.73	5.73
MBSED99-21	99.62	99.62	99.62	99.62	99.62	99.54	0.65	99.35	98.88	97.34	95.08	84.71	84.71	80.43	5.77	36.1	88.03	11.32	11.32
MBSED99-22	99.98	99.98	99.98	99.98	99.98	99.98	0.32	99.68	99.25	98.9	92.66	11.31	11.31	4.06	2.71	2.04	97.82	1.86	1.86
MBSED99-23	99.56	99.56	99.56	99.56	99.56	99.56	0.8	99.2	98.66	99.48	98.4	86.48	86.48	75.71	16.34	18.66	94.49	4.71	4.71
MBSED99-24	100	100	100	100	100	100	0	100	99.85	90.11	89.46	80.29	80.29	72.6	16.91	17.1	100	0	0
MBSED99-25	99.75	99.75	99.75	99.75	99.75	99.58	0.9	99.1	98.94	99.75	99.31	94.73	94.73	88.83	33.6	24.69	91.78	7.32	7.32
MBSED99-26	99.59	99.59	99.59	99.59	99.59	99.56	0.46	99.54	99.53	100.14	99.49	91.96	91.96	84.21	15.48	31.73	89.21	10.33	10.33
MBSED99-27	99.92	99.92	99.92	99.92	99.92	99.92	0.08	99.92	99.9	99.63	98.78	88.2	88.2	82.37	9.77	35.79	88.63	11.29	11.29
MBSED99-28	98.42	98.42	98.42	98.42	98.42	98.42	1.84	98.16	97.17	93.06	81.93	3.45	3.45	0.44	0.1	0.02	98.16	0	0
MBSED99-29	99.8	99.8	99.8	99.8	99.8	99.74	0.47	99.53	99.38	98.6	98	85.85	85.85	70.31	23.71	15.46	96.06	3.47	3.47
MBSED99-30	99.89	99.89	99.89	99.89	99.89	99.89	0.11	99.89	99.89	100	99.17	91	91	86	8.73	34.33	87.14	12.75	12.75
MBSED99-31	99.99	99.99	99.99	99.99	99.99	99.99	0.01	99.99	99.99	99.6	98.79	91.7	91.7	85.73	7.22	33.6	89.46	10.53	10.53
MBSED99-32	99.89	99.89	99.89	99.89	99.89	99.89	0.11	99.89	99.89	99.2	97.96	88.92	88.92	82.71	7.79	35.2	87.83	12.06	12.06
MBSED99-33	99.91	99.91	99.91	99.91	99.91	95.69	8.85	91.15	87.75	95.79	88.51	12.77	12.77	4.13	1.08	0.68	91.05	0.1	0.1
MBSED99-34	99.87	99.87	99.87	99.87	99.87	99.87	0.13	99.87	99.87	99.4	98.32	89.45	89.45	82.13	5.97	38.13	86.44	13.43	13.43
MBSED99-35	99.81	99.81	99.81	99.81	99.81	99.81	0.19	99.81	99.73	96.25	95.3	85.51	85.51	72.91	16.37	17.63	96.01	3.8	3.8
MBSED99-36	99.68	99.68	99.68	99.68	99.68	99.68	0.32	99.68	99.68	99.2	98.82	90.98	90.98	83.07	16.69	24.95	93.76	5.92	5.92
MBSED99-37	100	100	100	100	100	100	0	100	99.94	98.24	92.03	4.85	4.85	1.37	0.3	0.2	99.94	0.06	0.06
MBSED99-38	99.57	99.57	99.57	99.57	99.57	99.57	0.43	99.57	99.57	99.36	97.22	83.97	83.97	79.91	3.29	36.54	88.25	11.32	11.32
MBSED99-39	99.63	99.63	99.63	99.63	99.63	99.63	0.37	99.63	99.63	99.07	98.25	89.44	89.44	79.46	14.38	22.13	94.39	5.24	5.24
MBSED99-40	99.91	99.91	99.91	99.91	99.91	99.91	0.09	99.91	99.83	98.64	51.47	95.65	76.36	55.36	17.48	10.71	97.49	2.42	2.42
MBSED99-41	99.64	99.64	99.64	99.64	99.64	99.64	0.36	99.64	99.64	94.88	40.11	64.27	21.04	10.89	2.75	1.52	99.36	0.28	0.28
MBSED99-42	99.9	99.9	99.9	99.9	99.9	99.9	0.39	99.61	99.3	99.41	38.44	86.59	33.49	14.9	3.04	2.07	99.15	0.46	0.46
MBSED99-43	99.85	99.85	99.85	99.85	99.85	99.85	0.15	99.85	99.85	90.82	34.7	83.42	49.55	27.19	7.27	4.63	98.8	1.05	1.05

TABLE 3-5
REMEDIAL DESIGN SEDIMENT SAMPLE DENSITIES
McCormick & Baxter Creosoting Company Site
Portland, Oregon
October 1999

Sample ID	Sample Weight (g)	Volume (l)	Density (g/l)	Percent Solids
MBSED99-01	50.4	0.045	1120.0	57.4
MBSED99-02	68	0.048	1416.7	43.9
MBSED99-03	64.9	0.044	1475.0	43.6
MBSED99-04	72.9	0.046	1584.8	53.5
MBSED99-05	66.1	0.043	1537.2	44.0
MBSED99-06	85.5	0.041	2085.4	71.0
MBSED99-07	66	0.042	1571.4	41.2
MBSED99-08	73.9	0.044	1679.5	58.8
MBSED99-12	76.2	0.045	1693.3	55.1
MBSED99-15	61.8	0.042	1471.4	44.3
MBSED99-16	64.5	0.045	1433.3	58.3
MBSED99-17	63.8	0.042	1519.0	42.7
MBSED99-20	72.6	0.041	1770.7	93.6
MBSED99-21	63.9	0.043	1486.0	42.4
MBSED99-22	77.6	0.046	1687.0	97.2
MBSED99-23	62.8	0.046	1365.2	54.9
MBSED99-24	68.4	0.045	1520.0	50.6
MBSED99-25	75.5	0.048	1572.9	54.9
MBSED99-26	68.2	0.044	1550.0	50.9
MBSED99-27	69.7	0.046	1515.2	46.0
MBSED99-28	75.5	0.043	1755.8	98.3
MBSED99-29	79.1	0.045	1757.8	56.7
MBSED99-30	67.3	0.042	1602.4	50.8
MBSED99-31	92.2	0.048	1920.8	42.9
MBSED99-32	66.7	0.043	1551.2	40.9
MBSED99-33	71.6	0.048	1491.7	90.3
MBSED99-34	64.6	0.041	1575.6	42.3
MBSED99-35	64	0.045	1422.2	49.4
MBSED99-36	69.6	0.046	1513.0	49.3
MBSED99-37	74.1	0.042	1764.3	93.6
MBSED99-38	61.3	0.042	1459.5	39.3
MBSED99-39	72.5	0.045	1611.1	48.9

Note:

Sample densities based on in-field measurements of volume and weight. Percent solids was determined by the Oregon Analytical Laboratory.

g = grams

l = liters

TABLE 3-6
REMEDIAL DESIGN SEDIMENT PAH ANALYTICAL RESULTS
 January 2001
 McCormick & Baxter Creosoting Company
 Portland Plant
 Portland, Oregon
 (µg/kg)

Sample Identification	cPAHs	HPAHs	LPAHs	Total PAHs	LPAH/HPAH
MBSED01-01	204	500	93	593	0.2
MBSED01-02	116	306	666	972	2.2
MBSED01-03	195	420	44	464	0.1
MBSED01-04	218	452	52	504	0.1
MBSED01-05	137	370	57 U	370	NA
MBSED01-06	883	1,600	403	2,003	0.3
MBSED01-07	9,980	44,790	82,101	126,891	1.8
MBSED01-08	67	138	13 U	138	NA
MBSED01-09	724	1,594	546	2,140	0.3
MBSED01-10	32	80	13 U	80	NA
MBSED01-11	13 U	51	13 U	51	NA
MBSED01-12	13 U	13 U	13 U	13 U	NA
MBSED01-13	17,147	82,097	173,569	255,666	2.1
MBSED01-14	13 U	13 U	13 U	13 U	NA
MBSED01-15	13 U	13 U	13 U	13 U	NA
MBSED01-16	13 U	13 U	13 U	13 U	NA
MBSED01-17	2,028	3,707	981	4,688	0.3
MBSED01-18	1,101	2,584	1,049	3,633	0.4
MBSED01-19	47	92	13 U	92	NA
MBSED01-20	1,003	2,807	3,214	6,021	1.1
MBSED01-21	137	257	49	306	0.2
MBSED01-22	1,274	4,155	1,918	6,073	0.5
MBSED01-23	401	922	154	1,076	0.2
MBSED01-24	843	1,572	530	2,102	0.3
MBSED01-25	440	916	229	1,145	0.3
MBSED01-26	967	2,243	772	3,015	0.3
MBSED01-27	96	183	19	202	0.1
MBSED01-28	2,723	7,031	9,442	16,473	1.3
MBSED01-29	11,133	37,543	39,470	77,013	1.1
MBSED01-30	13 U	13 U	13 U	13 U	NA
MBSED01-40 (Duplicate of MBSED01-03)	310	606	64	670	0.1
MBSED01-41 (Duplicate of MBSED01-13)	14,020	82,320	205,900	288,220	2.5
MBSED01-45 (Duplicate of MBSED01-23)	544	1,328	553	1,881	0.4

Shaded cells indicate contaminant concentration exceeding the ROD cleanup goal for sediment.

Reference locations include MBSED01-30.

Key:

cPAHs = Carcinogenic PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, pyrene, fluoranthene, and indeno(1,2,3-cd)pyrene.

HPAHs = High-molecular-weight PAHs including fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene.

LPAHs = Light-molecular-weight PAHs including: naphthalene, acenaphthalene, acenaphthene, fluorene, phenanthrene, and anthracene.

µg/kg = Microgram per kilogram.

NA = Not available. Analytical test not performed on this sample.

PAHs = Polynuclear aromatic hydrocarbons.

ROD = Record of Decision.

U = The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

ROD Cleanup Goal

cPAHs = 2,000 µg/kg.

TABLE 3-7
REMEDIAL DESIGN SEDIMENT GRAIN SIZE RESULTS
January 2001
McCormick & Baxter Creosoting Company Site
Portland Plant
Portland, Oregon

Seive Size	Coarse Gravel	Fine Gravel				Coarse Sand	Medium Sand			Fine Sand			% Sand								
	1"	3/4"	1/2"	3/8"	% Gravel	#4	#10	#20	#40	#60	#100		#200	32	22	13	9	7	3.2	1.3	% Silt/Clay
Sample ID	% Passing	% Passing	% Passing	% Passing		% Passing	% Passing	% Passing	% Passing	% Passing	% Passing		% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing	
MBSED01-01	100.0	79.9	74.2	74.2	31.16	68.8	62.7	59.6	57.4	50.1	45.5	26.1	42.8	34.7	29.0	20.7	17.6	12.9	8.3	5.2	42.8
MBSED01-02	100.0	92.9	87.9	84.3	20.95	79.0	72.1	70.9	68.4	45.0	10.1	76.3	2.7	3.1	3.1	3.6	2.6	2.1	3.6	2.6	2.7
MBSED01-03	100.0	100.0	100.0	100.0	0.15	99.8	99.8	99.8	99.4	99.1	98.6	6.8	93.0	71.2	59.9	37.4	35.6	28.1	19.7	15.0	93.0
MBSED01-04	100.0	100.0	100.0	100.0	0.00	100.0	100.0	99.9	99.5	99.1	98.4	8.6	91.4	68.7	56.4	42.3	35.3	28.2	19.4	12.3	91.4
MBSED01-05	100.0	100.0	100.0	100.0	0.00	100.0	100.0	99.9	99.4	99.0	98.3	7.9	92.1	69.0	54.3	38.8	31.9	25.9	17.2	8.6	92.1
MBSED01-06	100.0	100.0	100.0	100.0	0.00	100.0	99.9	99.9	99.1	97.4	94.8	17.3	82.7	55.4	49.7	35.3	30.6	24.8	15.3	8.6	82.7
MBSED01-07	100.0	100.0	100.0	100.0	1.61	98.4	96.2	91.0	88.6	87.3	86.3	15.6	82.8	73.8	63.7	53.7	46.1	37.7	26.0	18.4	82.8
MBSED01-08	100.0	100.0	100.0	100.0	4.64	95.4	89.4	84.8	50.7	14.6	7.4	89.7	5.7	3.9	3.3	3.3	2.6	2.6	2.0	2.6	5.7
MBSED01-09	100.0	100.0	100.0	100.0	0.98	99.0	96.9	94.5	74.4	56.6	52.7	48.8	50.2	40.7	35.6	24.6	19.5	14.4	9.3	8.5	50.2
MBSED01-10	100.0	100.0	100.0	100.0	0.00	100.0	99.4	97.3	70.6	16.7	5.7	95.9	4.1	0.7	0.7	0.0	0.0	-0.7	-0.7	1.4	4.1
MBSED01-11	100.0	100.0	100.0	100.0	0.00	100.0	99.3	97.7	57.3	13.7	9.3	94.9	5.1	1.4	1.4	2.8	2.8	2.8	2.8	2.1	5.1
MBSED01-12	79.3	66.6	62.5	49.0	66.41	33.6	27.9	25.8	23.7	19.9	18.7	15.8	17.8	16.6	14.4	11.9	9.0	6.7	3.1	1.8	17.8
MBSED01-13	100.0	100.0	100.0	100.0	0.19	99.8	96.4	93.5	91.8	90.6	89.8	12.7	87.1	74.0	66.0	52.0	43.7	34.2	22.3	15.6	87.1
MBSED01-14	100.0	100.0	100.0	100.0	0.52	99.5	99.4	98.6	66.5	20.7	14.2	90.6	8.9	7.1	6.4	6.4	5.7	5.7	2.1	1.4	8.9
MBSED01-15	100.0	100.0	100.0	100.0	5.87	94.1	90.4	90.2	87.9	36.4	10.8	86.3	7.8	6.6	6.6	5.3	3.9	3.3	1.3	1.3	7.8
MBSED01-16	100.0	100.0	100.0	100.0	1.69	98.3	97.7	97.4	59.1	8.5	1.0	98.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MBSED01-17	100.0	92.7	83.8	82.2	35.48	64.5	50.8	47.1	29.4	9.4	4.6	61.3	3.2	2.2	1.5	1.5	1.1	0.7	0.0	0.0	3.2
MBSED01-18	100.0	100.0	100.0	100.0	2.69	97.3	95.6	95.2	93.9	91.7	89.7	17.6	79.7	54.0	43.5	32.3	27.0	21.0	14.3	9.0	79.7
MBSED01-19	100.0	100.0	100.0	100.0	0.00	100.0	99.0	98.6	82.2	27.9	17.4	84.8	15.2	11.6	8.7	7.3	5.8	5.1	2.9	1.5	15.2
MBSED01-20	100.0	100.0	100.0	100.0	0.50	99.5	98.8	98.4	97.2	95.2	93.0	24.8	74.7	46.4	38.1	29.8	26.5	21.5	14.9	9.1	74.7
MBSED01-21	100.0	100.0	100.0	100.0	4.43	95.6	91.2	89.6	64.0	24.5	16.7	83.8	11.8	7.2	5.3	4.6	4.0	2.6	1.3	1.3	11.8
MBSED01-22	100.0	100.0	100.0	100.0	1.09	98.9	98.4	97.7	85.0	46.6	29.0	76.7	22.2	15.8	12.6	10.3	8.7	6.3	3.2	2.4	22.2
MBSED01-23	100.0	100.0	100.0	100.0	0.00	100.0	99.7	99.5	97.7	94.9	92.3	23.1	76.9	52.4	40.7	31.0	25.2	21.3	13.6	9.7	76.9
MBSED01-24	100.0	100.0	100.0	100.0	0.15	99.8	98.7	97.8	82.6	53.6	42.7	65.7	34.1	21.9	17.4	14.3	11.3	7.5	6.0	3.8	34.1
MBSED01-25	100.0	100.0	100.0	94.9	5.58	94.4	91.0	89.1	71.8	38.3	31.9	73.0	21.4	11.8	9.6	6.6	5.2	3.7	2.2	2.2	21.4
MBSED01-26	100.0	100.0	100.0	100.0	0.34	99.7	97.8	96.4	88.6	82.6	79.2	34.0	65.6	41.3	33.2	25.2	20.1	18.1	9.1	8.1	65.6
MBSED01-27	100.0	100.0	100.0	100.0	0.00	100.0	99.9	99.9	99.5	99.1	97.6	20.3	79.7	48.0	36.7	25.4	19.8	18.8	12.2	9.4	79.7
MBSED01-28	100.0	100.0	100.0	100.0	0.15	99.8	99.7	99.5	99.1	98.6	98.0	8.6	91.2	64.8	49.4	37.7	28.1	26.1	15.5	11.6	91.2
MBSED01-29	100.0	100.0	100.0	100.0	0.00	100.0	99.9	99.8	99.4	99.0	98.2	6.7	93.3	66.0	52.5	37.2	28.1	22.2	13.7	8.1	93.3
MBSED01-30	100.0	100.0	100.0	100.0	0.10	99.9	99.4	99.1	97.6	75.6	39.7	78.9	21.0	12.3	10.8	7.9	7.9	7.9	3.6	3.6	21.0

TABLE 3-8
REMEDIAL DESIGN SEDIMENT BIOASSAY RESULTS
January 2001
McCormick & Baxter Creosoting Company
Portland Plant
Portland, Oregon

Sample Identification	<i>Hyalella azteca</i>	<i>Chironomus tentans</i>	
	Percent Survival	Percent Survival	Weight (mg)
MBSED01-01	86.3	75.0	1.57
MBSED01-05	81.3	72.5	1.42
MBSED01-07	28.8	12.5	0.30
MBSED01-09	83.8	56.3	1.06
MBSED01-11	87.5	63.8	1.18
MBSED01-12	67.5	52.5	1.31
MBSED01-15	81.3	73.8	2.01
MBSED01-16	91.3	82.5	1.76
MBSED01-18	81.3	75.0	1.47
MBSED01-19	78.8	86.3	1.43
MBSED01-21	80.0	76.3	1.68
MBSED01-22	88.8	65.0	1.04
MBSED01-24	86.3	65.0	1.15
MBSED01-26	80.0	51.3	0.62
MBSED01-27	82.5	77.5	1.31
MBSED01-28	90.0	68.8	1.05
MBSED01-29	8.8	0.0	NA
MBSED01-30	90.0	68.8	1.59
Laboratory Control (<i>H. azteca</i>)	87.5	NA	NA
Laboratory Control 1 (<i>C. tentans</i>)	NA	71.3	1.39
Laboratory Control 2 (<i>C. tentans</i>)	NA	70.0	1.26

Shaded cells indicate a statistically significant reduction from laboratory control at $p > 0.05$ using Wilcoxon two-sample test.
Reference locations include MBSED01-30.

Key:

mg = Milligrams.

NA = Not available. Results shown are only for bioassay test.

TABLE 3-9
REMEDIAL DESIGN SURFACE WATER ANALYTICAL RESULTS
October 1999
McCormick & Baxter Creosoting Company Site
Portland, Oregon
($\mu\text{g/L}$)

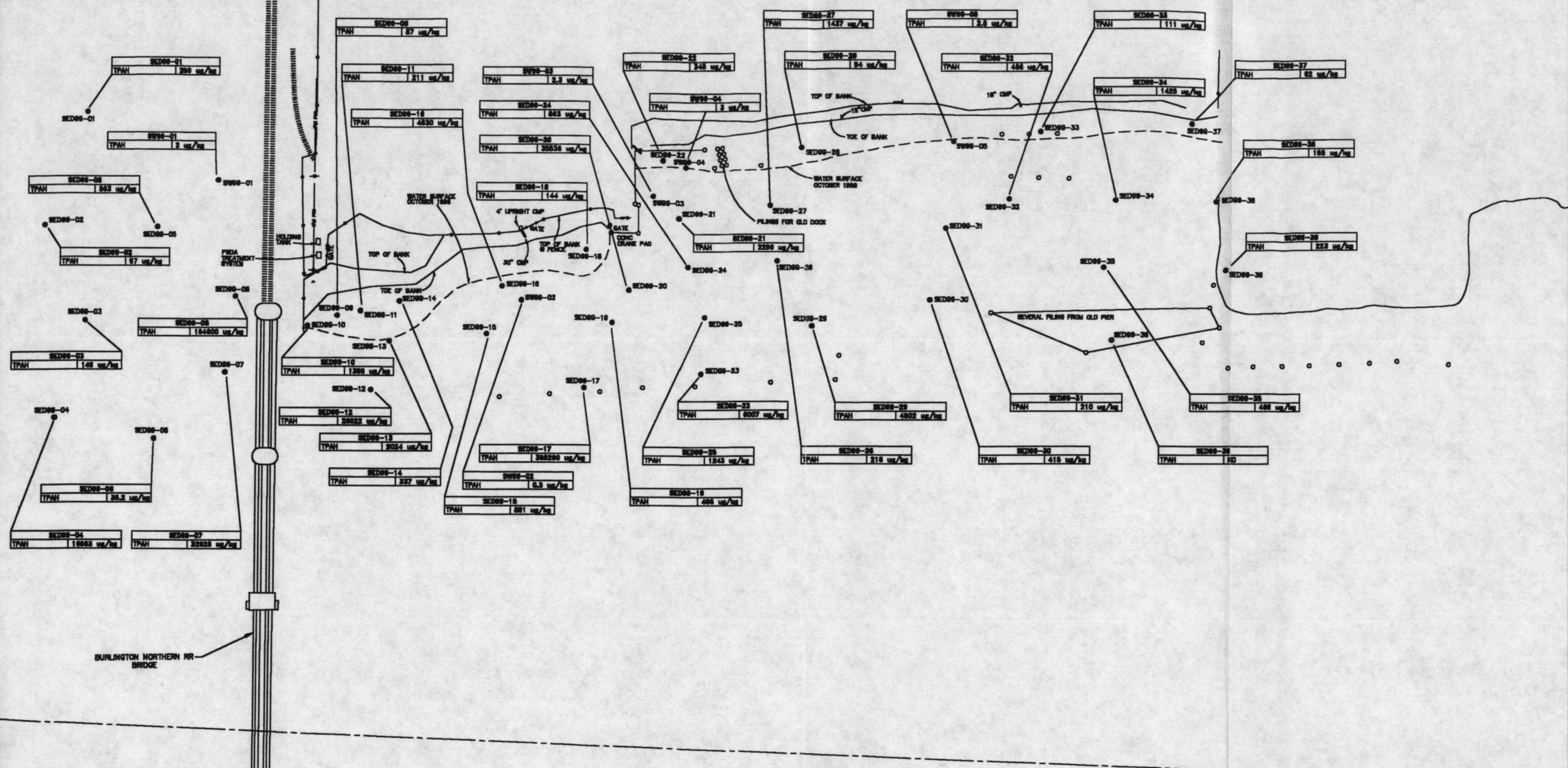
Sample Identification	Sample Depth (ft)	Carcinogenic PAHs	Low-Molecular-Weight PAHs	High-Molecular-Weight PAHs	Total PAHs	Arsenic	Pentachlorophenol
MBSW99-01	3.2	0.1 U	1.7	0.3	2.0	2 U	1.0 U
MBSW99-02	11.4	0.1 U	0.3	0.1 U	0.3	2 U	1.0 U
MBSW99-03	2.7	0.1 U	1.9	0.4	2.3	2 U	1.0 U
MBSW99-04	1.9	0.1 U	2.4	0.6	3.0	2 U	1.0 U
MBSW99-05	7.1	0.1 U	2.2	0.3	2.5	2 U	1.0 U
MBSW99-07 (Duplicate of MBSW99-04)	1.9	0.1 U	2.3	0.6	2.9	2 U	1.0 U

Key:

PAHs = Polynuclear aromatic hydrocarbons.

$\mu\text{g/L}$ = micrograms per liter.

U = The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.



LEGEND

○ SAMPLE LOCATION ID

○ TOTAL POLYNUCLEAR AROMATIC HYDROCARBON RESULTS

○ MOORING DOLPHIN

||||| RAILROAD TRACKS

SCALE IN FEET

0 100 200

FIGURE 3-1

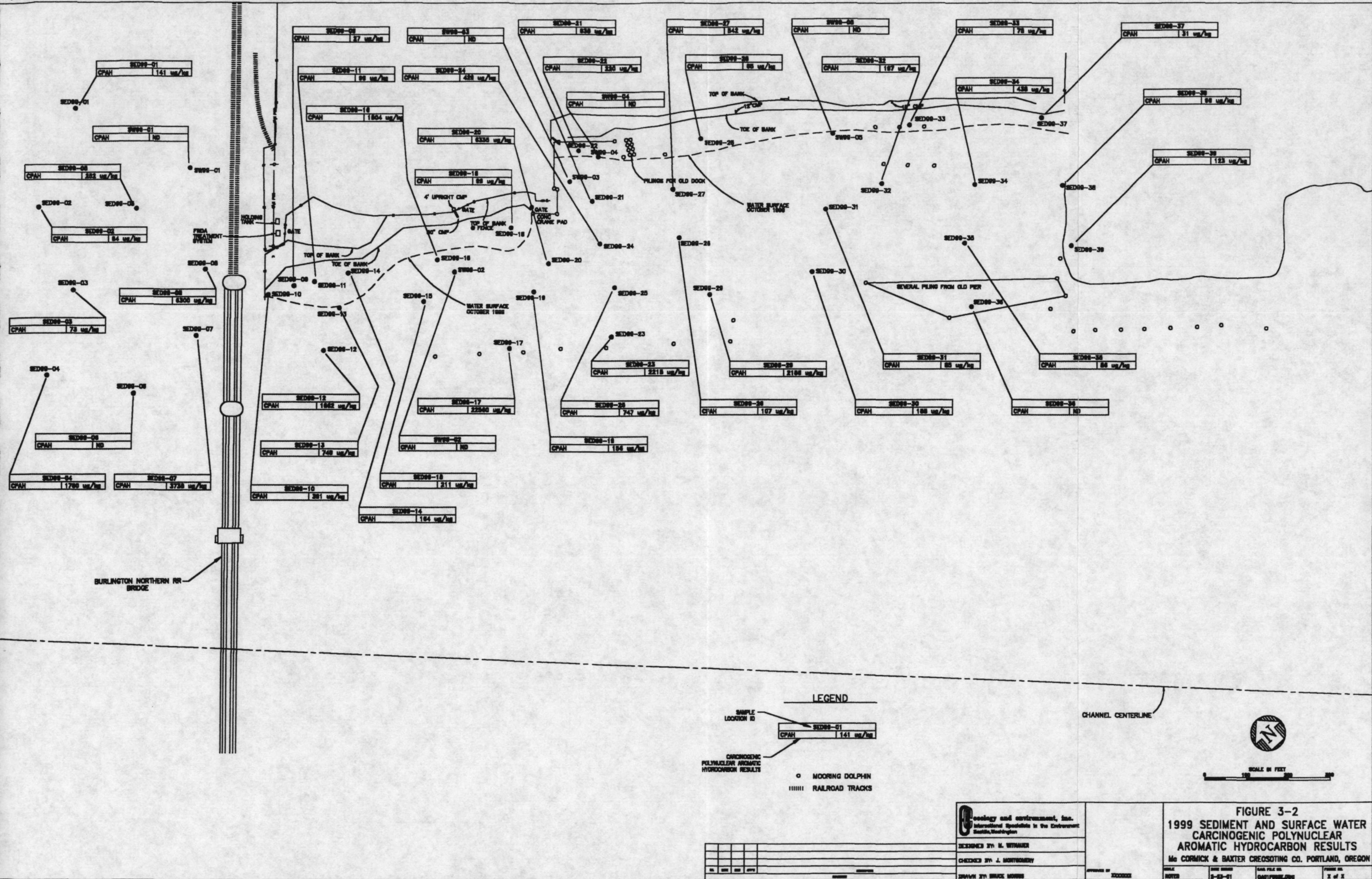
1999 SEDIMENT AND SURFACE WATER

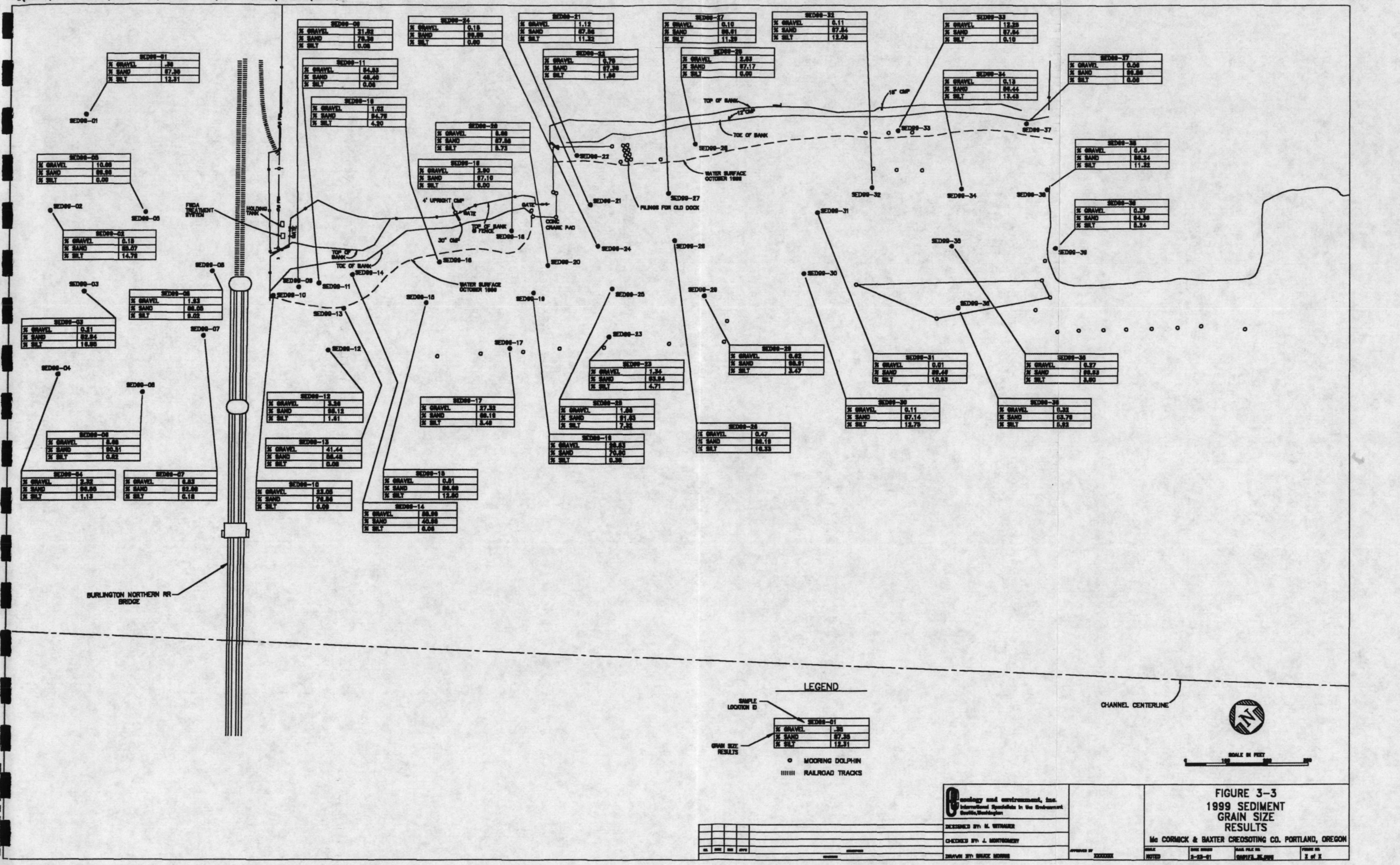
TOTAL POLYNUCLEAR AROMATIC

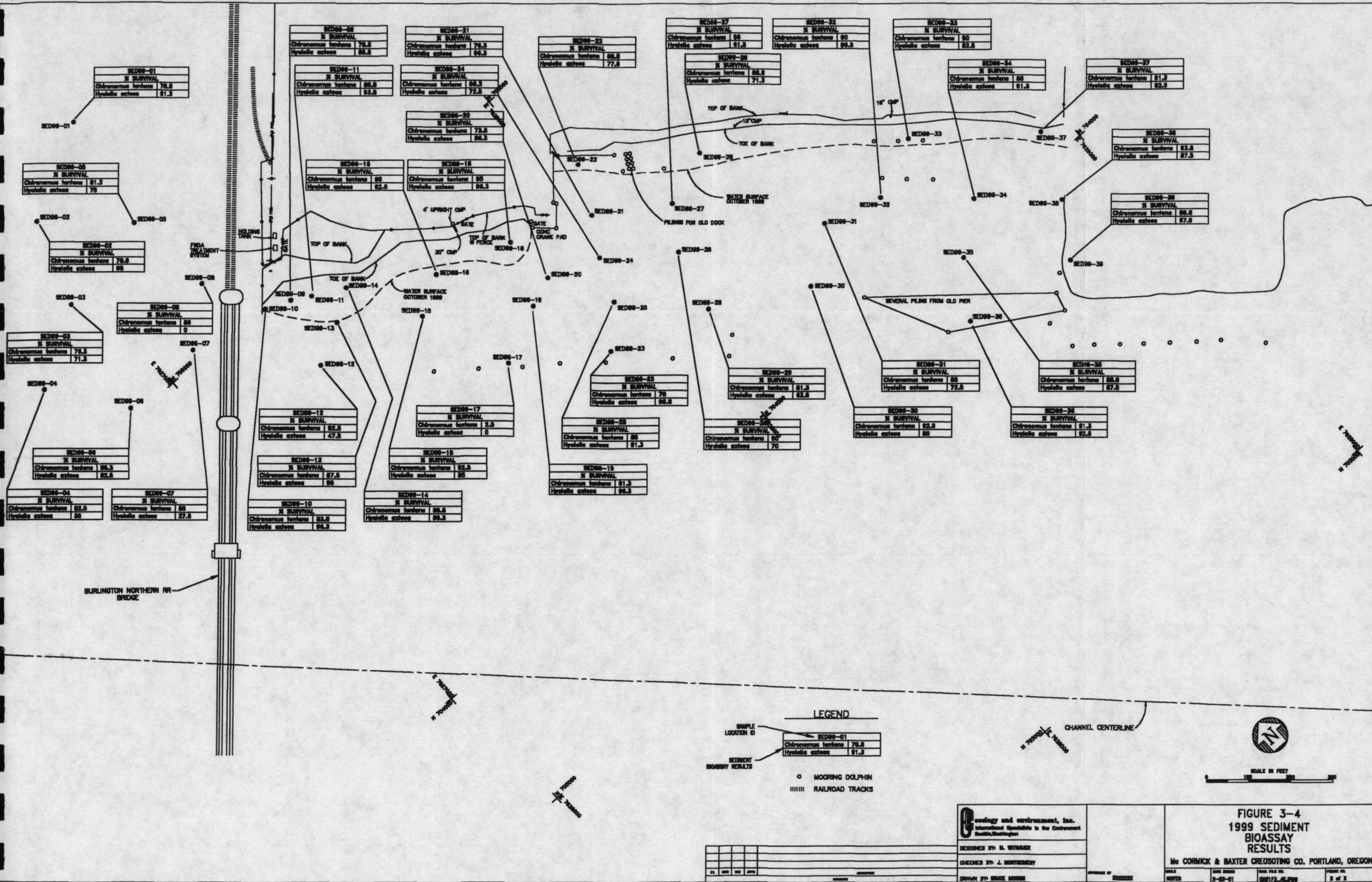
HYDROCARBON RESULTS

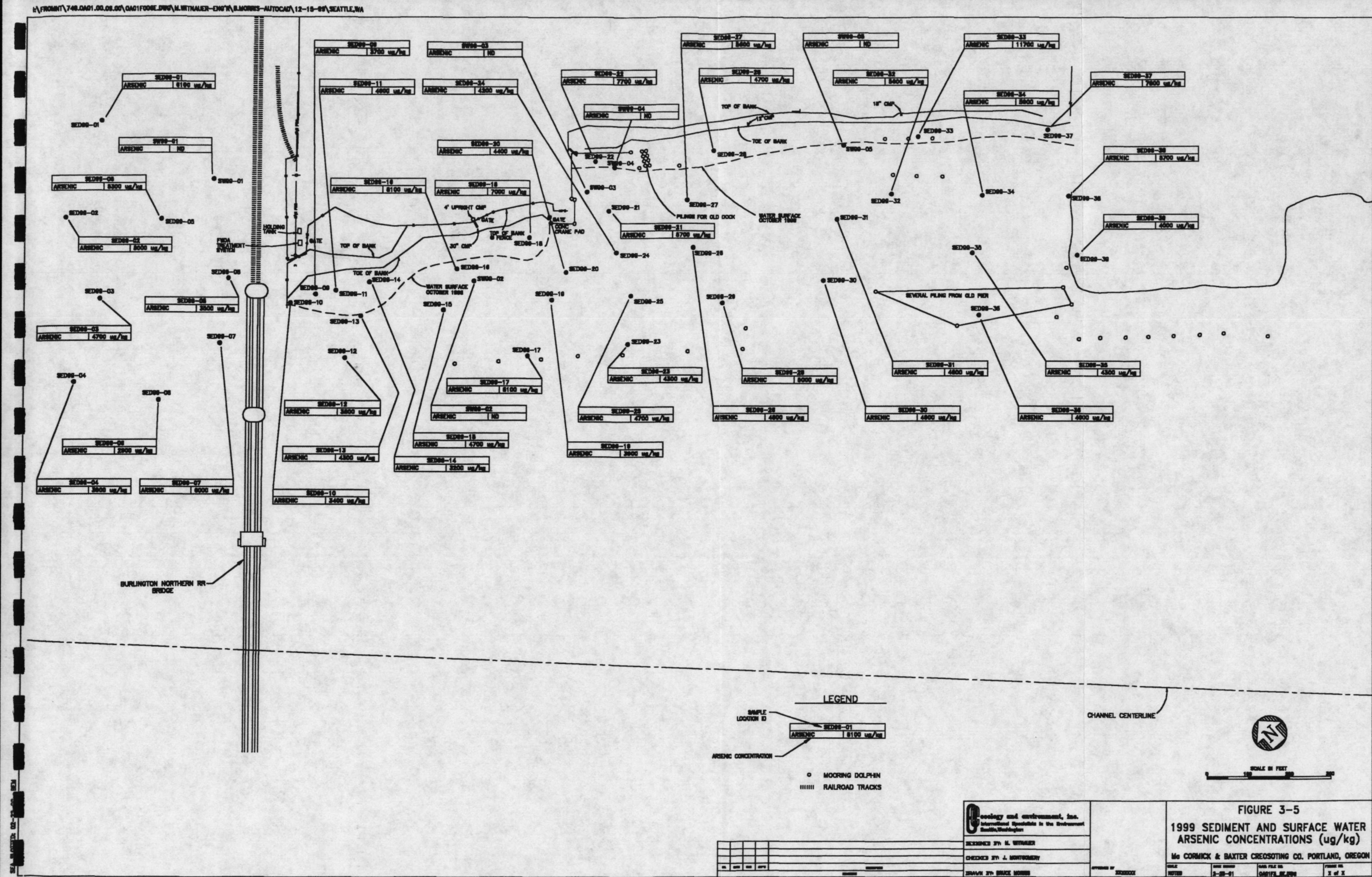
Mo CORMICK & BAXTER CREOSOTING CO. PORTLAND, OREGON

DESIGNED BY: J. WITHAUER	APPROVED BY: J. WITHAUER
CHECKED BY: J. WITHAUER	DATE: 2-25-01
DRAWN BY: BRUCE MORRIS	SCALE: 1"=100'

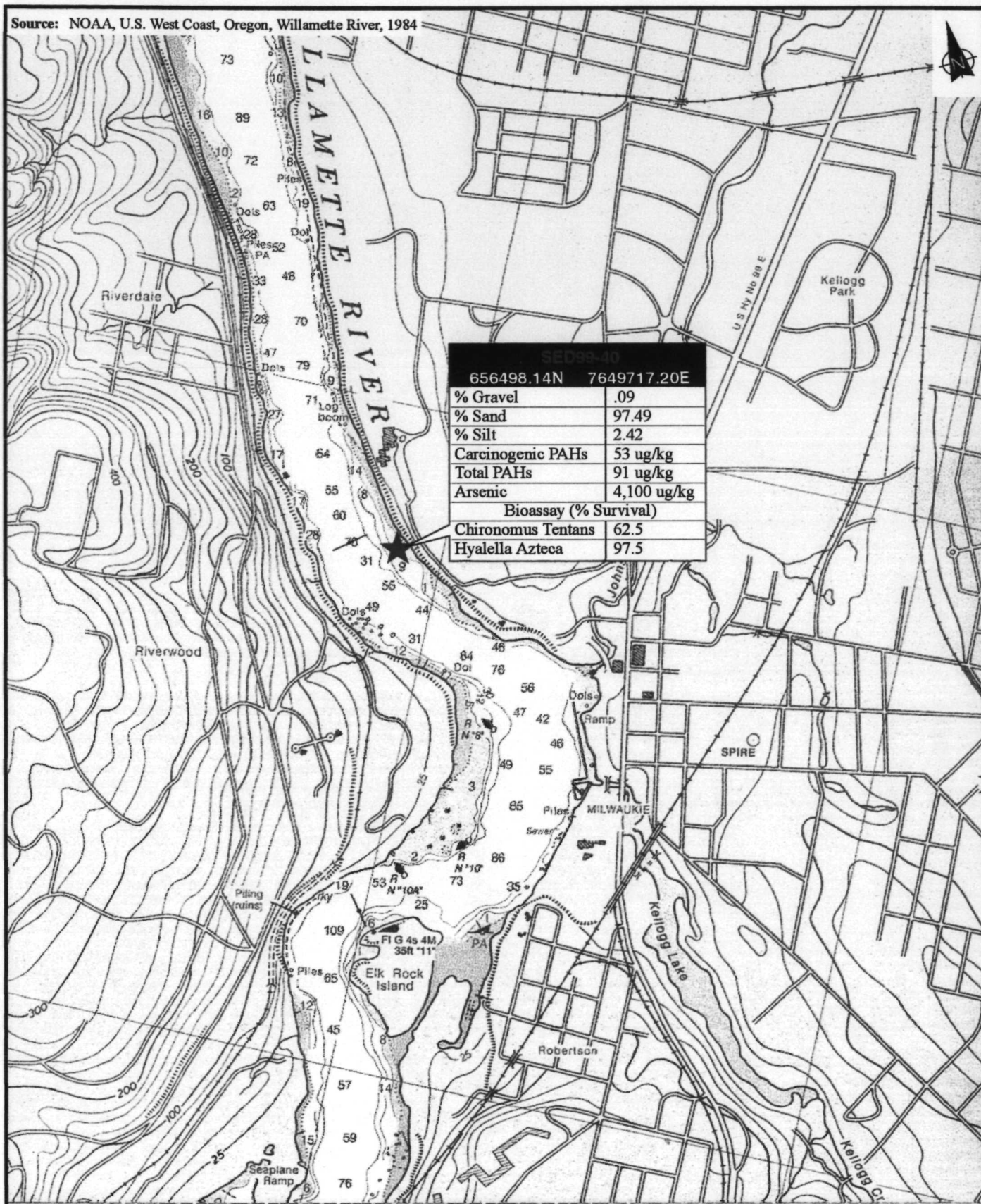








Source: NOAA, U.S. West Coast, Oregon, Willamette River, 1984



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CREOSOTING COMPANY**
Portland, Oregon

0 .25 .5
Approximate Scale in Miles

**Figure 3-6
UPSTREAM REFERENCE SAMPLE
SED99-40
RD SEDIMENT SAMPLING**

Drawn: AES	DATE: 3/2/00	JOB NO. 000749OA01001101	Dwg.No. OA01 6
---------------	-----------------	-----------------------------	-------------------

Source: NOAA, U.S. West Coast, Oregon, Willamette River, 1984

Note: ND = Not Detected above the method detection limit.



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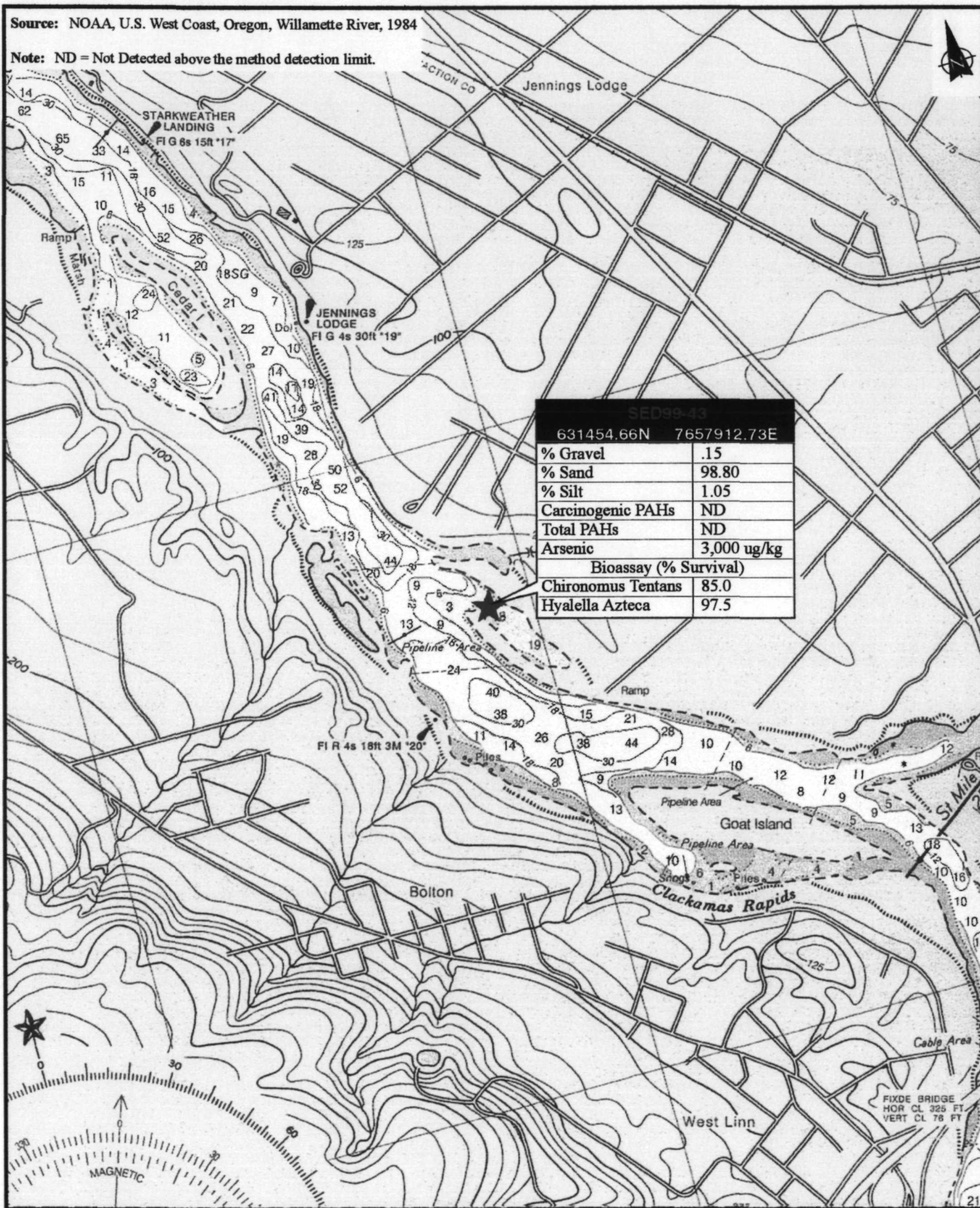
0 .25 .5
Approximate Scale in Miles

Figure 3-7
UPSTREAM REFERENCE SAMPLE
SED99-41 AND SED99-42
RD SEDIMENT SAMPLING

Drawn: AES	DATE: 3/2/00	JOB NO. 0007490A01001101	Dwg.No. OA01 7
---------------	-----------------	-----------------------------	-------------------

Source: NOAA, U.S. West Coast, Oregon, Willamette River, 1984

Note: ND = Not Detected above the method detection limit.



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0 .25 .5
Approximate Scale in Miles

**Figure 3-8
UPSTREAM REFERENCE SAMPLE
SED99-43
RD SEDIMENT SAMPLING**

Drawn: AES	DATE: 3/2/00	JOB NO. 0007490A01001101	Dwg.No. OA01 8
---------------	-----------------	-----------------------------	-------------------

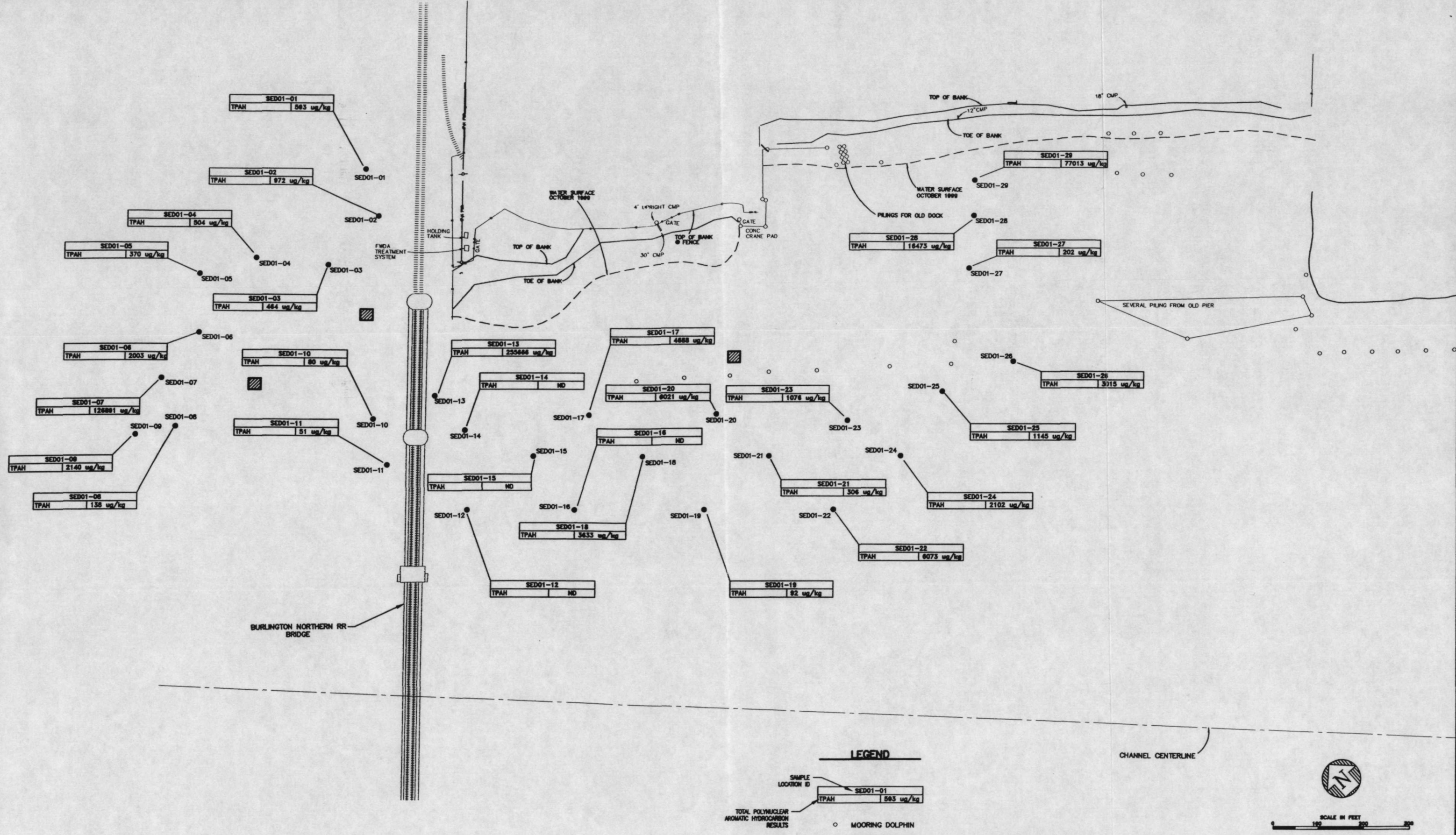


FIGURE 3-9 2001 SEDIMENT TOTAL POLYNUCLEAR AROMATIC HYDROCARBON RESULTS Mc CORMICK & BAXTER CREOSOTING CO. PORTLAND, OREGON			
DESIGNED BY: M. WITHAUER	DATE: 08/21/01	CAR FILE NO: 08/173-01-002	FIGURE NO: 3-9
CHECKED BY: J. MONTGOMERY	SCALE: 1:100	DATE: 08/21/01	FIGURE NO: 3-9
DRAWN BY: BRUCE MORRIS	APPROVED BY: 00000000	SCALE: 1:100	FIGURE NO: 3-9

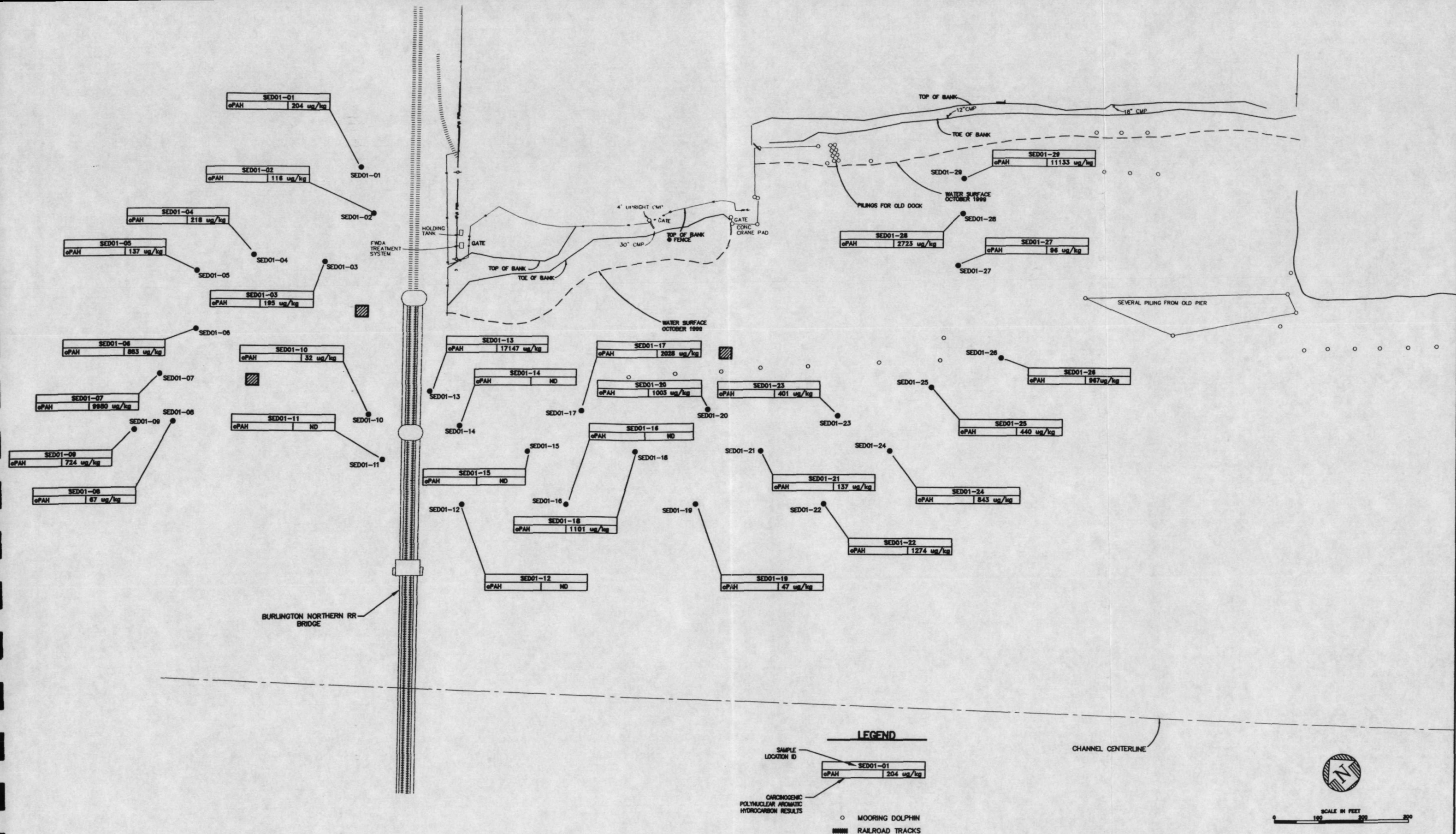


FIGURE 3-10
2001
SEDIMENT CARCINOGENIC POLYNUCLEAR
AROMATIC HYDROCARBON RESULTS
 Mc CORMICK & BAXTER CREOSOTING CO. PORTLAND, OREGON

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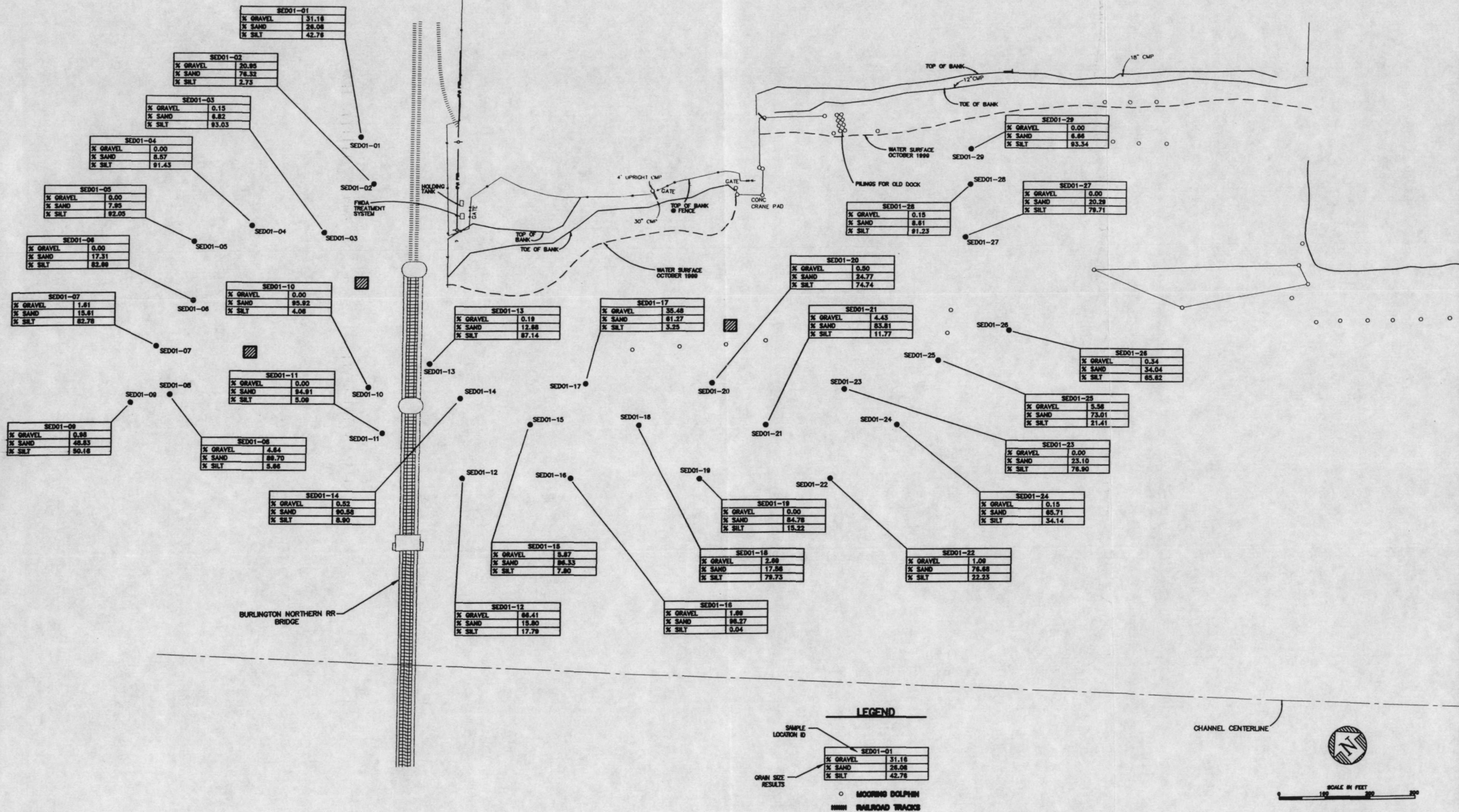
DESIGNED BY: M. WITMAIER

CHECKED BY: J. MONTGOMERY

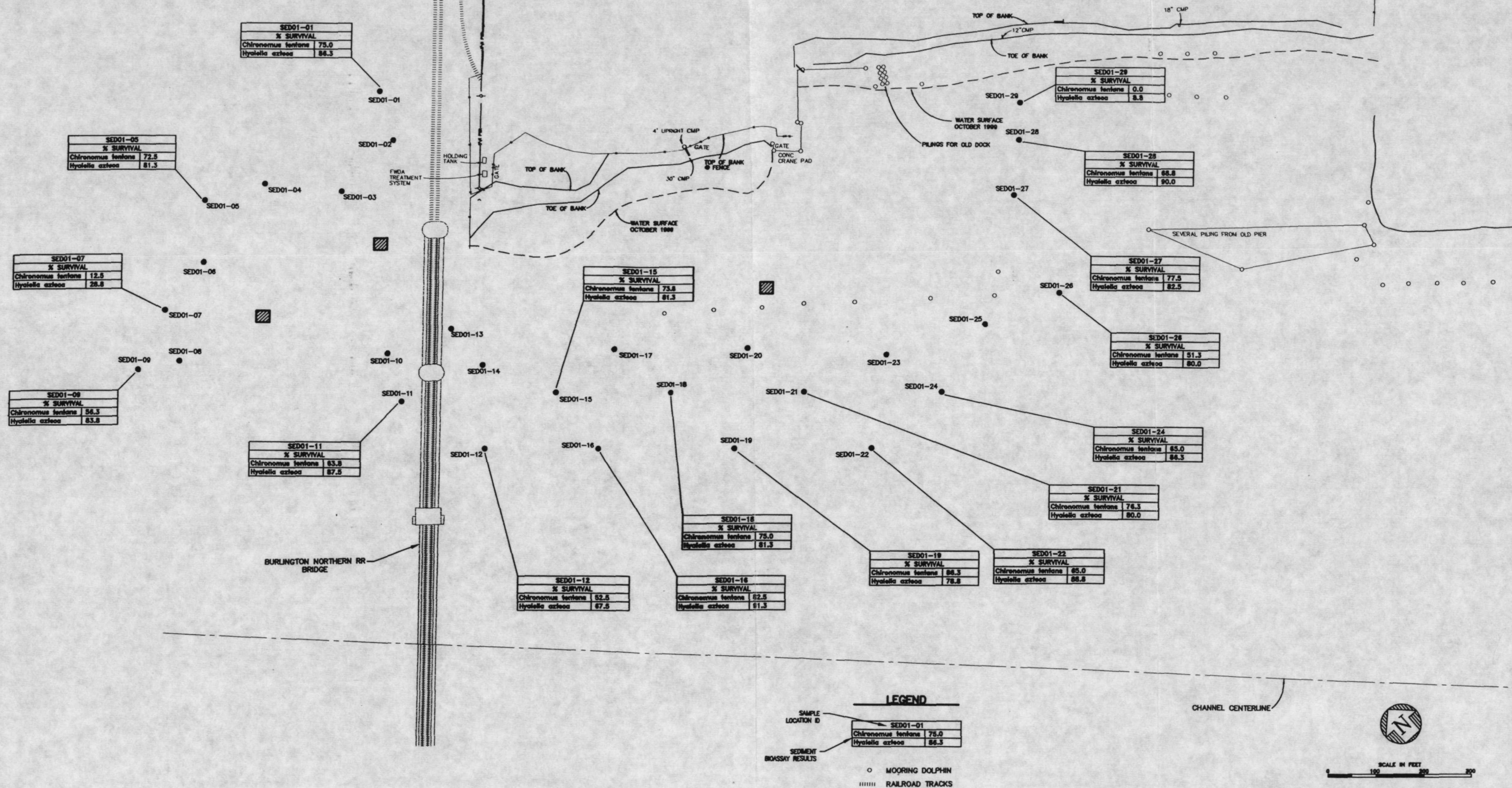
DRAWN BY: BRUCE MORRIS

APPROVED BY: K000000

NO.	DATE	BY	APPV



Ecology and environment, Inc. International Specialists in the Environment Seattle, Washington		FIGURE 3-11 2001 SEDIMENT GRAIN SIZE RESULTS	
DESIGNED BY: M. WYNAUER CHECKED BY: J. MONTGOMERY DRAWN BY: BRUCE MORRIS		Mc CORMICK & BAXTER CREOSOTING CO. PORTLAND, OREGON SCALE: 1" = 100' DATE: 01-22-01 CAS FILE NO: 040173.11E.DWG FIGURE NO: 3-11	



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Seattle, Washington

DESIGNED BY: M. WILKINSON

CHECKED BY: J. MONTGOMERY

DRAWN BY: BRUCE MORRIS

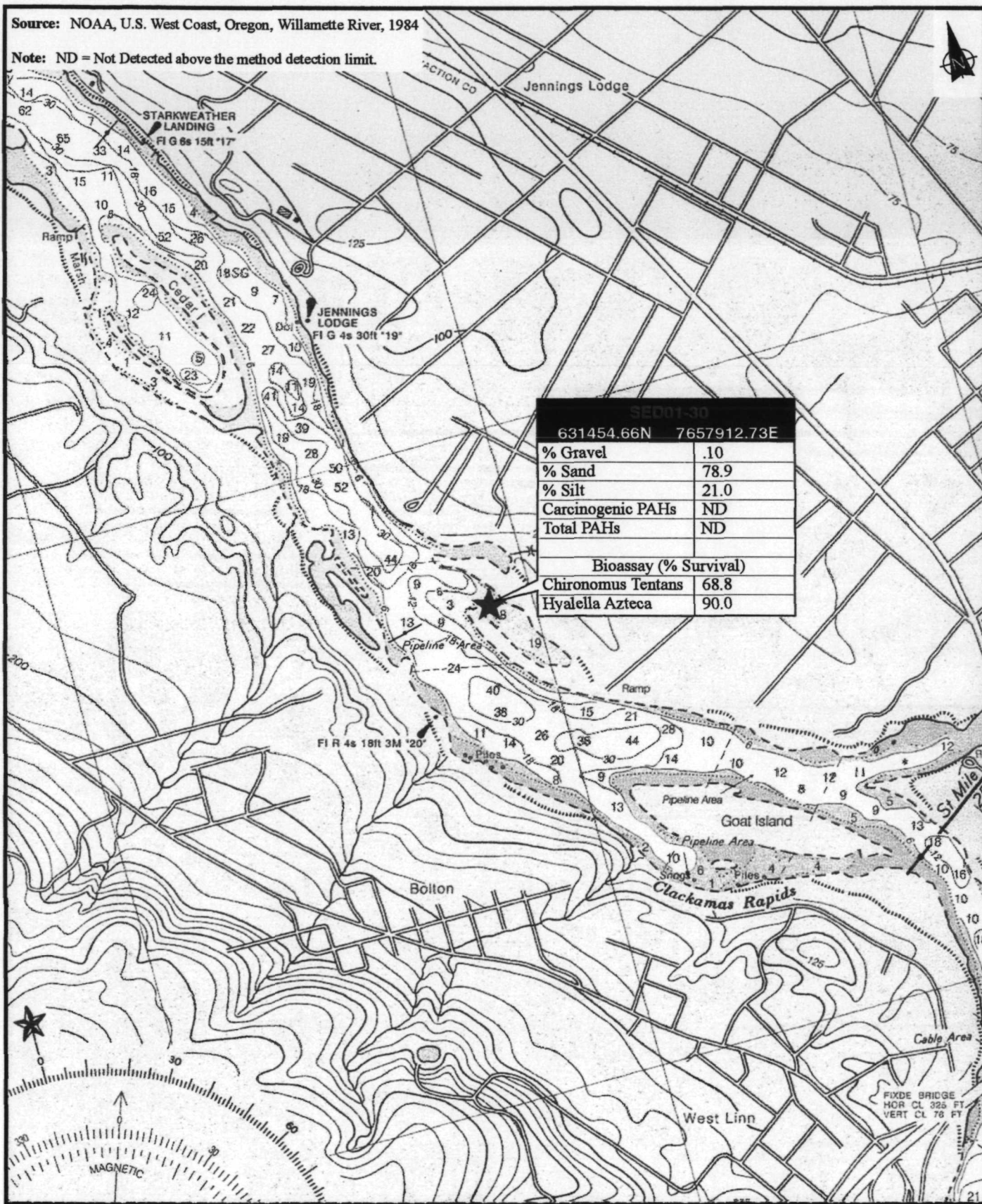
FIGURE 3-12
2001
SEDIMENT BIOASSAY
RESULTS

Mc CORMICK & BAXTER CREOSOTING CO. PORTLAND, OREGON

SCALE: 1" = 100' DATE: 01-22-01 CAS FILE NO: 048178-127-001 FIGURE NO: 3-12

Source: NOAA, U.S. West Coast, Oregon, Willamette River, 1984

Note: ND = Not Detected above the method detection limit.



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MCCORMICK & BAXTER
CREOSOTING COMPANY
Portland, Oregon

0 .25 .5
Approximate Scale in Miles

Figure 3-13
UPSTREAM REFERENCE SAMPLE
SED01-30
RD SEDIMENT SAMPLING

Drawn: HJB	DATE: 2/19/01	JOB NO. 000749OA01001101	Dwg.No. OA019
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Figure 3-14
Hyalella azteca Survival vs. Total PAHs
 October 1999

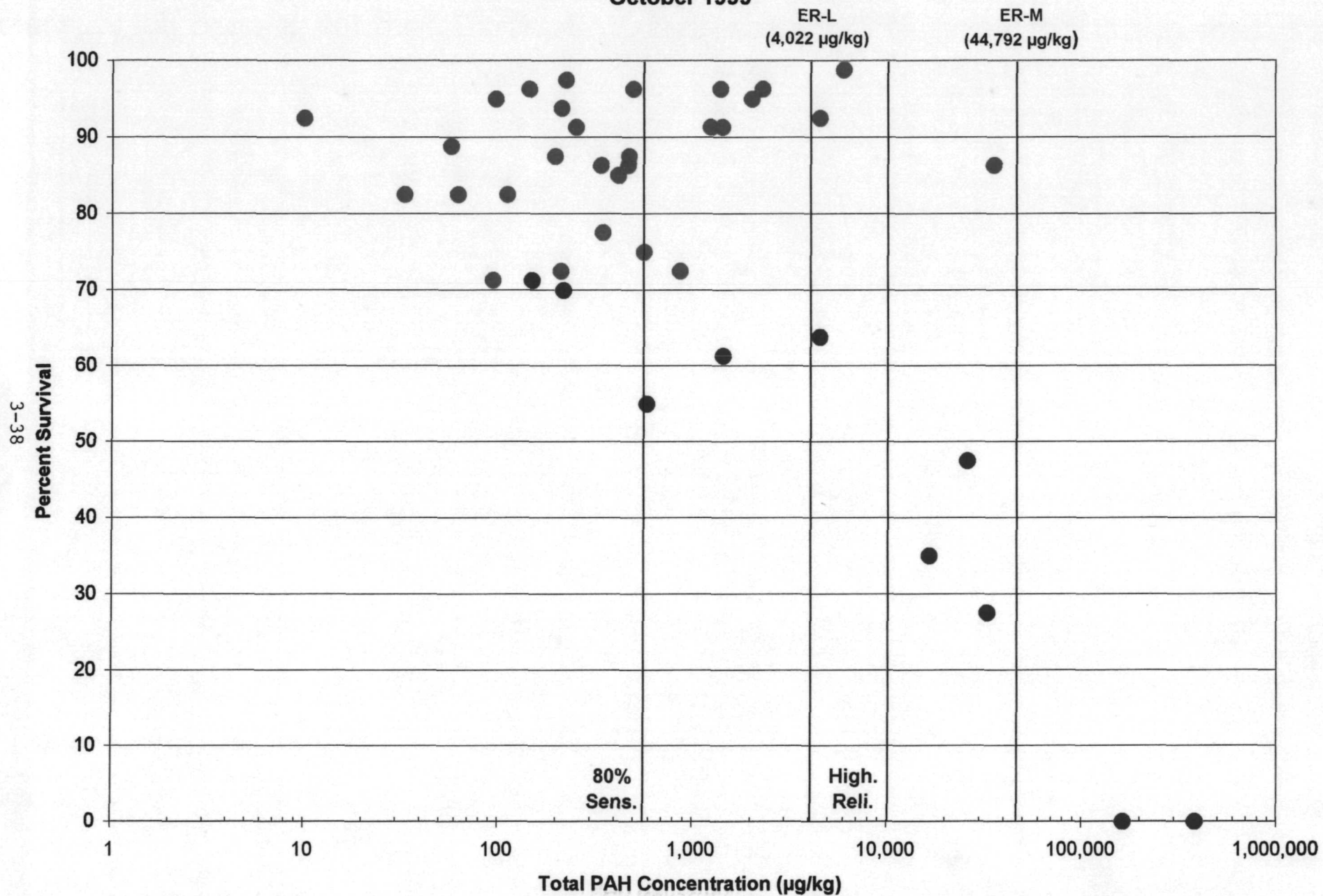
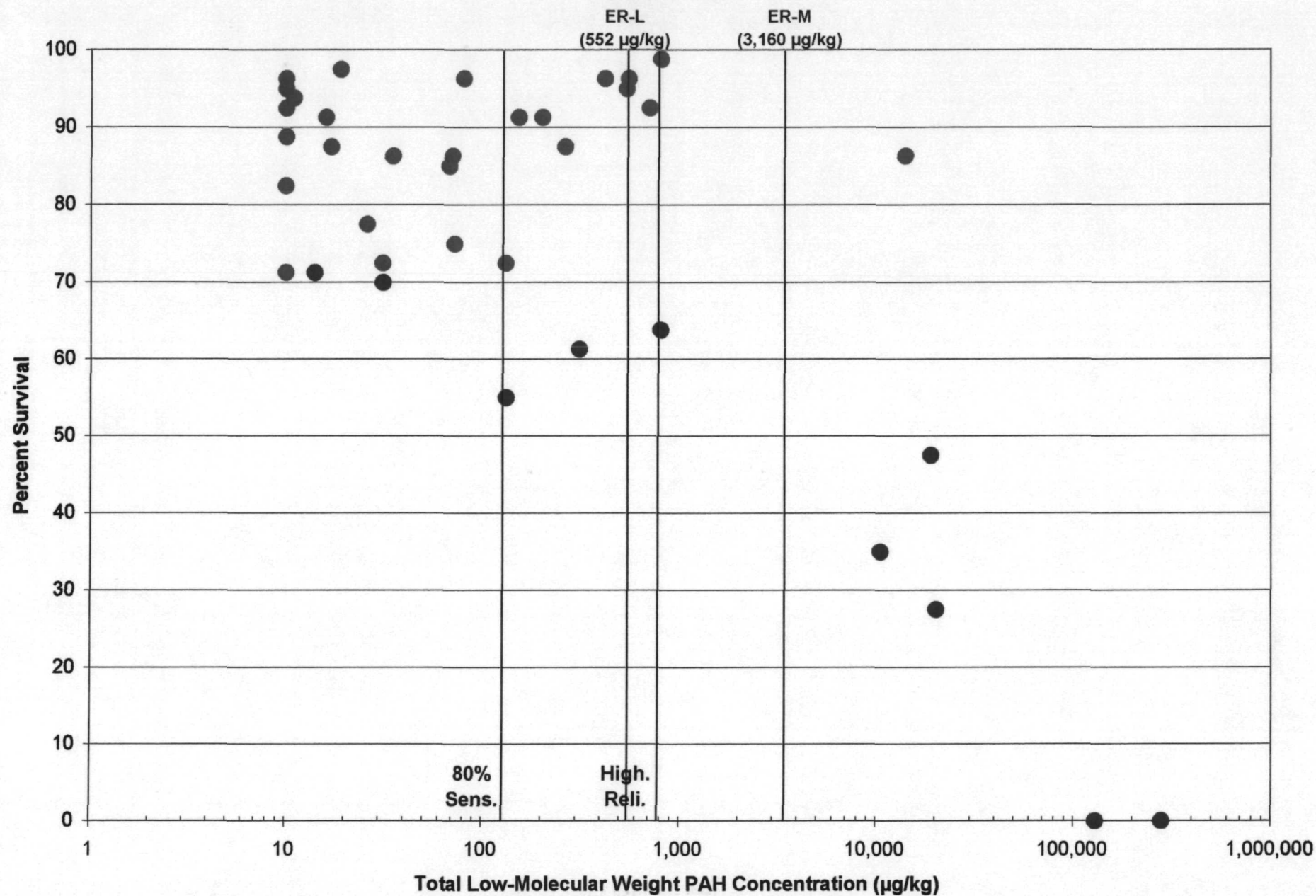


Figure 3-15
***Hyalella azteca* Survival vs. Low-Molecular-Weight PAHs**
October 1999



4

Conclusions and Recommendations

During Phase I RD sampling (October 1999), 39 site sediment samples and four upstream reference samples were collected and analyzed for PAHs, PCP, arsenic, and grain size (see Tables 3-1 and 3-2). Phase I RD sampling results indicated that sediment contamination extended to the east end of the shipping channel, although the lateral extent of the contamination was not identified. To address this data gap, 29 site sediment samples and one upstream reference sediment sample were collected and analyzed for PAHs and grain size (see Tables 3-5 and 3-6) in January 2001. Analytical results for sediment samples collected on site were evaluated against the ROD cleanup goals (see Table 1-1) and compared to analytical results from reference locations. In addition, subsurface sediment samples and NAPL samples were collected to obtain information required for permeation modeling of the proposed cap.

In October 1999, ⁶ five of the 30 sediment samples (MBSED01-07, -13, -17, -28, and -29) displayed cPAH results exceeding the ROD cleanup goal of 2,000 µg/kg. These sediment samples were collected in Willamette Cove immediately downstream of the BNRR bridge (MBSED99-07 and -08), along the east side of the shipping channel (MBSED99-17, -20, and -23), and southwest of the TFA (MBSED99-29; see Figure 3-2). Upstream reference sample sediment chemistry results for arsenic, PCP, and PAHs were low or nondetect (see Table 3-2).

In January 2001, five sediment samples (MBSED01-07, -13, -17, -28, and -29) displayed cPAH results exceeding the ROD cleanup goal of 2,000 µg/kg. These sediment samples were collected in Willamette Cove downstream of the BNRR bridge (MBSED01-07), immediately upstream of the BNRR bridge along the east side of the shipping channel (MBSED01-13), west of the TFA along the east side of the shipping channel (MBSED01-17), and southwest of the TFA in the lagoon (MBSED01-28 and -29; see Figure 3-2). Sediment sample MBSED99-13, collected at the bottom of the

-01-01-99

99-07
-08
-17
-20
-23
-29

01-01-01
4-1

4. Conclusions and Recommendations

slope, contained the highest cPAH concentration, 17,147 µg/kg. PAHs were not detected in the reference sediment sample (MBSED01-30).

Analytical results also were evaluated for significant adverse effects to benthic life. In October 1999, *Chironomus tentans* exhibited significant mortality in one sediment sample collected at the McCormick & Baxter site (MBSED99-17, 2.5% survival) and in one upstream reference sample (MBSED99-40, 62.5% survival). In October 1999, significant mortality of *Hyaella azteca* test organisms was exhibited in 11 of 39 sediment samples collected at the McCormick & Baxter site. Only four of these 11 sediment samples (MBSED99-07, -08, -17, and -29) also displayed analytical results exceeding ROD cleanup goals. The remaining two sediment samples with exceedences of ROD cleanup goals (MBSED99-20 [6,335 µg/kg] and -23 [2,215 µg/kg]) exhibited 86.3% and 98.8% *Hyaella azteca* survival, respectively.

In January 2001, significant mortality of *Hyaella azteca* and *Chironomus tentans* test organisms was exhibited in two of 17 sediment samples collected at the McCormick & Baxter site. These samples (MBSED01-07 and -29) also displayed analytical results exceeding the ROD cleanup goals. Based on the results from the Phase I and Phase II RD sampling, it was determined that other factors, rather than cPAH concentrations alone, are likely responsible for adverse effects to benthic life.

The current cleanup goals for sediment are designed to prevent direct human contact with sediment contaminated above health-based levels and to prevent exposure of benthic life to sediment contaminated above known toxicity levels. Based on the results of the chemical analyses and toxicity testing, the ROD cleanup goals were not found to be protective of benthic life. No Oregon or federal freshwater sediment quality criteria exist.

As outlined in the selected sediment remedy (Alternative SD-2a of the ROD), areas to be capped include those with the most highly contaminated sediment based on either toxicity to aquatic organisms or human health risks. Although it was found that factors other than the analytes listed in the ROD cleanup goals may be responsible for adverse effects to benthic life, it is recommended to proceed with the remedy outlined in Alternative SD-2a (capping contaminated sediment) and to include areas that exhibited significant adverse effects to benthic life and significant risks to human health. These areas are as follows (see Figure 2-1):

4. Conclusions and Recommendations

- ▲ Five locations in Willamette Cove downstream of the FWDA (MBSED99-03, -04, -07, and -08, and MBSED01-07);
- ▲ Six locations above the navigation channel, at the top of the slope (MBSED99-20, -26, -27, and -29, and MBSED01-28 and -29); and
- ▲ Five locations along the east side of the navigation channel, at the bottom of the slope (MBSED99-12, -15, and -17, and MBSED01-13 and -17).

The most severe adverse effects to benthic life and/or levels of contamination were found in sediment collected from the southwest edge of the sampled area (MBSED99-12, -17, and -23, and MBSED01-13 and -17). Phase II sampling conducted in January 2001 determined that cPAH contamination at the bottom of the slope, extending toward the navigation channel, was below ROD cleanup goals. The proposed sediment cap, discussed in Section 4.1, would incorporate areas that failed either of two criteria: exceedance of the ROD cleanup goals or adverse effects, including mortality, to benthic life.

4.1 Proposed Sediment Cap

The selected remedy for sediment includes capping areas that contain contaminants above risk-based cleanup levels for human health and/or that exhibit significant biological toxicity. Based on the levels of contamination discovered in the sediment during the RD sediment and surface water sampling, E & E estimated the extent of the sediment that will have to be capped. Figure 4-1 shows the proposed sediment cap boundary based on biological analysis and cPAH contamination. The total area for this cap would be approximately 17 acres and would extend along the shoreline from the former creosote dock, under the railroad bridge, and just downstream into Willamette Cove to the north.

Figure 4-1 displays approximate sediment areas failing bioassays and areas exceeding the current ROD cleanup goals based on the October 1999 and January 2001 sampling events. Highlighted areas include those that showed a statistically significant reduction in at least one of the two bioassay criteria: *Hyaella azteca* survival or *Chironomus tentans* survival. As discussed in Section 3.3.1, the only ROD cleanup goal that was exceeded in any sediment sample was 2 mg/kg for cPAHs; consequently, Figure 4-1 indicates areas likely to exceed this concentration of cPAHs.

5

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A

Field Data Sheets

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-01 E & E Personnel: R. Whitchurch
Sample Date: 01-05-01 H. Brunelle
Sample Time: 1215

Sample Description

Color: DK brown silt, Brown sand.

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: for 0-10" SOFT SILT Concrete Cobbles and gravel present
10"-15" F-VFSand

Other Notes:

15" x 4" ID PVC Tube Sampler (2 Tubes collected)

USCS

Samples:

PAH (802)

Phys Param (16 oz)

Bio Assay (5L)

Actual: 705364 N
7627340 E
(Approx) (center of Boat)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-02 E & E Personnel: R. Whitechurch

Sample Date: 01-05-01 H. Brunelle.

Sample Time: 1200 (noon)

Sample Description

Color: BROWN

Benthics: ONE CLAM (NOT LINING - SHELL ONLY)

Organic Matter: LEAVES, TWIGS at surface to 2" Depth

NAPL Odor: NONE

Staining: VISIBLE SHEEN AND LT STAINING

Substrate: VF-F SAND with silt near surface layer
(0-2 inches). GRAVEL AT surface.

Other Notes:

15" x 4" ID PVC Sampler Tube
USCS

Samples:
PAH (8oz)
Phys Param (16oz)

RIPP-RAPP from embankment
on river bed.

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-03 E & E Personnel: R. Whitechurch

Sample Date: 01-05-01 H. Brunelle.

Sample Time: 1150 (DUPL: SED01-40 at 0830)

Sample Description

Color: DK Brown-GRAY

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT WITH TRACE VF SAND

Other Notes:

15" x 4" ID PVC tube sampler

USCS

Samples:

PAH (8oz)

Phys Param (16oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-004 E & E Personnel: H. Brunelle
R. Whitehurst
Sample Date: 01-05-001
Sample Time: 0950⁰⁰ 0957

Sample Description

Color: DK gray-brown

Benthics: NONE

Organic Matter: None

NAPL Odor: None

Staining: None

Substrate: SILT WITH SOME VF SAND, SOFT

Other Notes:

15" x 4" ID PVC Sampler

USCS

Samples: Physical Param (16oz)
PAH (8oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-05 E & E Personnel:

H. Brunelle

Sample Date: 01-05-01

R. Whitechurch

Sample Time: 1440

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT, Possible VF sand in low quantity.

Other Notes:

15" x 4" ID PVC tube sampler (2 TUBES collected)

USCS

Samples:

PAHs (8oz)

Phys. Param (16oz)

BioAssay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: sed 01-006 E & E Personnel: H. Brunette
R. Whitehead
Sample Date: 01/05/01
Sample Time: 0925

Sample Description

Color: DK Gray-brown

Benthics: none

Organic Matter: NONE

NAPL Odor: none

Staining: none

Substrate: SILT, SOFT, no sufficient debris with some VF sand.

Other Notes:

4" ID PVC sample tube, 15" long
USCS

SAMPLES:

~~PR~~
Physical Param. (16oz)
PAH (8oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-07 E & E Personnel: R. Whitechurch

Sample Date: 01-05-01 H. Brunelle

Sample Time: 1010

Sample Description

Color: DK Gray-brown

Benthics: NONE

Organic Matter: WOODY DEBRIS, COARSE (untreated, 1-2" lengths)

NAPL Odor: NONE

Staining: NONE

Substrate: SILT WITH SOME VF SAND

Other Notes: 15" x 4" ID PVC Tube Sampler, 2 Tubes collected
USCS

SAMPLES: BIOASSAY (5L)
PHYSICAL PARAM. (16oz)
PAH (8oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-08 E & E Personnel: R. Whitchurch
H. Brunelle
Sample Date: 01-05-01
Sample Time: 1100

Sample Description

Color: Red, brown, DK gray, black sand grains.

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: F-VF LITHIC SAND WITH TRACE SILT and Trace
F Pebble & gravel.

Other Notes:

15" x 4" PVC Tube Sampler

USCS

Samples:

PAH (802)

Phys. Param (1602)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SEDO1-009 E & E Personnel: R. Whitchurch

Sample Date: 01-05-01 H. Brunelle.

Sample Time: 1035

Sample Description

Color: DK Gray-brown

Benthics: NONE

Organic Matter: FINE WOODY DEBRIS

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT WITH M-VF SAND
F

Other Notes:

15" x 4" ID PVL Sample Tube (2 Tubes)

USCS

Samples:

Physical Perm (16oz)

PAH (8oz)

Bioassay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-10 E & E Personnel: R. Whitechurch
H. Brunelle.
Sample Date: 01-05-01
Sample Time: 1117

Sample Description

Color: Dark Brown (Multi sand)

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: F-VF SAND WITH SOME SILT

Other Notes:

15" x 4" ID PVC Sampler Tube

USCS

SAMPLES:

PAH (8oz)

Phys. Parum (16oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-11 E & E Personnel: H. Brunelle
R. Whitchurch
Sample Date: 01-05-01
Sample Time: 1130

Sample Description

Color: VDK-Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: M-VF SAND WITH ^(Bv) SOME SILT
LITTLE

Other Notes:

15" x 4" ID PVC Sampler Tube (2 Tubes)

USCS

Samples:

PAH (8oz)

Phys. Param (16oz)

Dio Assay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-12 E & E Personnel: H. Brunelle
R. Whitchurch
Sample Date: 01-05-01
Sample Time: 1340

Sample Description

Color: Dark Gray to Gray

Benthics: OCCASIONAL CLAMS (LIVE)

Organic Matter: NONE

NAPL Odor: NONE

Staining: LIGHT SHEEN

Substrate: SILT, SAND, AND CONCRETE/RUBBLE (GRAVEL TO COBBLE SIZE).

Other Notes:

15" x 4" PVC Sampler Tube (2 Tubes collected)

USCS

Samples:

PAH (8oz) - low recovery jar (2/3 full)

Phys Param (16oz)

Bio Assay

Large concrete fragments on bottom

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-13 E & E Personnel: H. Brunelle
Sample Date: 01-05-01 R. Whitechurch
Sample Time: 1410

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: LEAVES/STICKS ON SURFACE OF BOTTOM

NAPL Odor: NONE (w)

Staining: LIGHT (w) MODERATE SHEEN

Substrate: SOFT SILT

Other Notes:

15" x 4" ID PVC tube sampler
USCS
Samples:
PAH (8oz)
Phys Param (16oz)
Duplicate collected (SED01-41 at time 1300)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-14 E & E Personnel: R. Whitchurch

Sample Date: 01-05-01 H. Brunelle

Sample Time: 1420

Sample Description

Color: Dark Brown

Benthics: NONE

Organic Matter: NONE (TWIGS/STICKS ON SURFACE)

NAPL Odor: NONE

Staining: NONE

Substrate: F-VF SAND (LITHIC)

Other Notes:

15" x 4" ID PVC tube sampler

USCS

Samples:

PAH (80z)

PhysParam (16 oz)

Wooden debris in bottom (assorted)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED 01-15 E & E Personnel: H. Brunelle
R. Whitchurch
Sample Date: 01-05-01
Sample Time: 1453

Sample Description

Color: Brown to Black (MULTI)

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: VF-F LITHIC SAND WITH TRACE F. ~~Pebbles~~ Gravel.

Other Notes:

15" x 4" ID PVC Tube Sampler (2 Tubes collected)
USCS

Samples:
PAH (8oz)
Phys Param (16oz)
BioAssay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-16 E & E Personnel: R. Whitchurch

Sample Date: 01-05-01 H. Brunelle.

Sample Time: 1508

Sample Description

Color: Black

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: VF-F BASALTIC SAND

Other Notes:

15" x 4" ID PVC Sampler Tube (2 Tubes
collected)

USCS

Samples:

PAH (8oz)

Phys Param (16oz)

Bio Assay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-16 E & E Personnel: R. Whitehurst
H. Brunelle
Sample Date: 01-08-01
Sample Time: 0920 Depth:

Sample Description

Color: Dark Gray-brown

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: VERY SOFT SILT

Other Notes:

15" x 4" ID PVC Sampler Tube (3 Tubes collected)
USCS

Samples:

PAH (800)

Phys Param (1600)

BioAssay (5 L)

NOTE: Heather Brunelle reports there was significant sand in the last @ the sample and did not give me a representative sample to Litho-characterize.

DISCARD
(collected twice)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-17 E & E Personnel: R. Whitchurch
H. Brunelle
Sample Date: 01-08-01
Sample Time: 1115 Depth:

Sample Description

Color: Black (sand)

Benthics: NONE

Organic Matter: WOOD DEBRIS (1-3 inch splinters)

NAPL Odor: NONE

Staining: NONE

Substrate: VF-M SAND WITH SOME SILT AND FEW
COARSE SAND GRAINS

Other Notes:

15" x 4" ID PVC Tube Sampler (1 Tube
collected)

USCS

Samples collected:

PAH (8oz)

Phys Param (16oz)

~~Bio Assay (5L)~~ (RD)

Rocks, debris on bottom reported by diver.

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED 01-18 E & E Personnel: R. Whitchurch
Sample Date: 01-08-01 H. Brunelle
Sample Time: 1015 Depth:

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT WITH TRACE F SAND

Other Notes:

15" x 4" ID PVC Tube Sampler
(2 tubes collected)

USCS

Samples:

PAH (8 oz)

Phys Param (16 oz)

Bio Assay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-19 E & E Personnel: R. Whitchurch
Sample Date: 01-08-01 H. Brunelle
Sample Time: 0940 Depth.

Sample Description

Color: Dark Gray to Black

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: F-VF SAND

Other Notes:

15" x 4" ID PVC Tube Sampler (2 collected)

USCS

Samples:

PAH (802)

Phys Param (1600)

Bio Assay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-20 E & E Personnel: R. Whitehead
Sample Date: 01-08-01 H. Brunelle
Sample Time: 1125

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: LITTLE FINE WOODY DEBRIS

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT WITH LITTLE FINE SAND

Other Notes:

15" x 4" ID PVC Tube Sampler

USCS

Samples:

PAH (802)

Phys Param (1602)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-21 E & E Personnel: R. Whitehead
Sample Date: 01-08-01 H. Brunelle
Sample Time: 1030 Depth: 42 feet (measured)

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate:

Other Notes:

15" x 4" ID PVC Sampler (3 tubes collected)

USCS

Samples:

PAH (8oz)

Phys Param (16oz)

BioAssay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-22 E & E Personnel: R. Whitechurch
H. Brunelle
Sample Date: 01-08-01
Sample Time: 1000 Depth:

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: Small pieces of plant matter (Trace)

NAPL Odor: NONE

Staining: NONE

Substrate: ~ 6" ^{silt} SILT underlain by VF Sand.

Other Notes:

15" x 4" ID PVC Sampler Tube (2 tubes collected)
USCS

Samples:
PAH (802)
Phys Param (1602)
Bio Assay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED 01-23 E & E Personnel: R. Whitchurch
Sample Date: 01-08-01 H. Brunelle
Sample Time: 1138

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT WITH LITTLE FINE SAND

Other Notes:

15" x 4" ID PVC Sampler Tube

USCS

Samples:

PAH (8oz)

Phys. Param (16oz)

Field Dupe Collected (SED 01-45) (1415)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-24 E & E Personnel: R. Whitcomb

Sample Date: 01-08-01

Sample Time: 1055 Depth: 53 feet (measured)

Sample Description

Color: Dark Gray, black sand

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: 0 - ~3 inches SOFT SILT
~3 - 15 inches VF SAND AND SILT

Other Notes:

15" x 4" ID PVC Tube Sampler
(2 Tubes collected)

USCS

Samples:

PAH (802)

Phys. Param (1602)

BioAssay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED 01-25 E & E Personnel:

R. Whitchurch

Sample Date: 01-08-01

H. Brunelle

Sample Time: 1155

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: WOOD DEBRIS

NAPL Odor: NONE

Staining: NONE

Substrate: VF - F SAND WITH ~~SOME~~ LITTLE SILT

Other Notes:

15" x 4" ID PVC Tube Sample

USCS

Samples:

PAH (8oz)

Phy. Param (16oz)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-26 E & E Personnel: R. Whitechurch

Sample Date: 01-08-01 H. Brunelle

Sample Time: 1415⁰⁰ Depth: 38 feet (measured)

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE¹⁰⁰ SMALL WOOD DEBRIS

NAPL Odor: NONE

Staining: NONE¹⁰⁰ Sheen

Substrate: SOFT SILT WITH VF SAND

Other Notes:

15" x 4" ID PVC Sampler Tube

USCS

Samples:

RAH (802)

PhysParam (1602)

BioAssay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-27 E & E Personnel: H. Brunelle
Sample Date: 01-05-01 R. Whitchurch
Sample Time: 1530

Sample Description

Color: GRAY

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT

Other Notes:

15" x 4" ID PVC Tube Sampler
(2 Tubes collected)

USCS

Samples:

PAH (8oz)

PhysParam (16oz)

BioAssay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED 01-28 E & E Personnel: H. Brunelle
Sample Date: 01-05-01 R. Whitchurch
Sample Time: 1540

Sample Description

Color: Dark Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT

Other Notes:

15" x 4" ID PVC tube Sampler

USCS

Samples:

PAH (8oz)

Phys Param (16oz)

Bio Assay (5 L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

Sample Location: SED01-29 E & E Personnel: H. Brunelle
Sample Date: 01-05-01 R. Whitechurch
Sample Time: 1550

Sample Description

Color: Gray

Benthics: NONE

Organic Matter: NONE

NAPL Odor: NONE

Staining: NONE

Substrate: SOFT SILT

Other Notes:

15" x 4" ID PVC Tube Sampler
(2 Tubes Collected)

USCS

Samples:

PAH (8oz)

Phys Parem (16oz)

BioAssay (5L)

McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

SEDIMENT REMEDIAL DESIGN

FIELD DATA SHEET

BACKGROUND LOCATION

Sample Location: SED 01-30 E & E Personnel: R. Whitechurch
Sample Date: 01-08-01 H. Brunelle
Sample Time: 1355

Sample Description

Color: Dark Gray

Benthics: midges/worm

Organic Matter: Plant debris

NAPL Odor: NONE

Staining: NONE

Substrate: F-VF sand with little silt

Other Notes:

15" x 4" ID PVC Tube Sampler (2 tubes collected)

USCS

Samples:

PAH (8oz)

Phys Param (16oz)

BioAssay (5L)

Location near boat ramp

B

Subsurface Sediment Bore Logs

provided for: OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY McCormick & Baxter Creosoting Company Portland, Oregon		DATE BEGAN : 02/05/01 DATE FINISHED : 02/05/01 FIELD GEOLOGIST : J. Spiegel LOG EDITOR : R. Whitchurch LOG CHECKED BY : M. Ochsner DRILLING FIRM : Geo-Tech Explorations, Inc. DRILLING METHOD : Direct push NORTHING : 705104 ft EASTING : 7627109 ft GROUND ELEV. : -11 feet MRL		BOREHOLE DIA. : 4 inches	
Depth in Feet	GRAPHIC	USCS	DESCRIPTION	REMARKS	
0			MEAN RIVER STAGE WILLAMETTE COVE	Difficult penetration through debris. Sample B-SED01-01 collected in (7) 1-L clear wide mouth jars for pore water analysis (SVOCs, DOC).	
5					
10					
15	ML		11.0' - 12.0' Silt/Clay - Predominantly fines with trace of very fine sand, grey.		
15	SP		12.0' - 17.0' WOODY DEBRIS - Wood and plant fragments ~ (60%) with ~ (40%) sand matrix.	No detectable chemical odor or discoloration observed in the sediments extracted. B-SED01-03 was sampled with an Austenburg Piston sampler in shallow water in Willamette Cove.	
20	SM		17.0' - 26.0' Silty Sand - Dark gray to black, medium to fine-grained sand with silt.		
25					
30					
35					
40					
45					
50					
55					
60					

02-22-2001 O:\MCCORMICK\MCCORMICK 0A01\SEDIMENT ROD\BORE LOGS 020501\BSED01-01 BOR


 ecology and environment, inc.
 International Specialists in the Environment

LOG OF BORING B-SED01-01

02-22-2001 0:\MCCORMICK\MCCORMICK OA01\SEDIMENT RID\BORE LOGS 020501\BSED01-02 BOR

provided for: OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY		DATE BEGAN : 02/05/01 DATE FINISHED : 02/05/01 FIELD GEOLOGIST : J. Spiegel LOG EDITOR : R. Whitchurch LOG CHECKED BY : M. Ochsner DRILLING FIRM : Geo-Tech Explorations, Inc. DRILLING METHOD : Direct push NORTHING : 705128 ft EASTING : 7626849 ft GROUND ELEV. : -45.5 feet MR		BOREHOLE DIA. : 4 inches	
McCormick & Baxter Creosoting Company Portland, Oregon					
Depth in Feet	GRAPHIC	USCS	DESCRIPTION	REMARKS	
0			WILLAMETTE RIVER CHANNEL- MEAN RIVER STAGE		
5				B-SED01-02 was sampled with an Austenburg Piston sampler in moderately deep water in Willamette Cove.	
10					
15					
20					
25					
30					
35					
40					
45					
45		SM	45.5'-49.5' SILTY SAND- Grey, poorly graded, ~(60%) fines, with ~(40%) sand.		
50		GP	49.5'-51.5" GRAVEL - Sandy gravel, poorly graded, grey.	No detectable chemical odor or discoloration observed in the sediments extracted.	
50			51.5'-60.0' SILTY SAND - Dark grey to black, medium-fine grained ~(60%)sand, with ~(40%)fines.		
55		SM		Sample B-SED01-02 collected in (7) 1-L clear wide mouth jars for pore water analysis (SVOCs, DOC).	
60					
ecology and environment, inc. International Specialists in the Environment			LOG OF BORING B-SED01-02 (Page 1 of 1)		

provided for: OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY	DATE BEGAN : 02/05/01 DATE FINISHED : 02/05/01 FIELD GEOLOGIST : J. Spiegel LOG EDITOR : R. Whitchurch LOG CHECKED BY : M. Ochsner DRILLING FIRM : Geo-Tech Explorations, Inc. DRILLING METHOD : Direct push NORTHING : 704500 ft EASTING : 7627764 ft GROUND ELEV. : -20 feet MRL	BOREHOLE DIA. : 4 inches
McCormick & Baxter Creosoting Company Portland, Oregon		

Depth in Feet	GRAPHIC	USCS	DESCRIPTION	REMARKS
0			WILLAMETTE RIVER CHANNEL - MEAN RIVER STAGE	
5				
10				
15				
20			20.0' - 29.0' SILT - Grey silt with some very fine sand..	
25		ML		
30		SM	29.0' - 32.0' WOODY DEBRIS - Wood fragments with sand and silt.	
35		SM	32.0' - 40.0' SILTY SAND - Dark grey to black, medium-fine grained ~ (60%) sand, with ~ (40%) fines. Thin lenses (1/2") of fines throughout sample interval.	Sample B-SED01-03 collected in (7) 1-L clear wide mouth jars for pore water analysis (SVOCs, DOC).
40				
45				Strong creosote and naphthalene odor present in sediments from 29.0' to 40.0' below mean river stage. Some NAPL was observed at this interval, but not widespread.
50				
55				B-SED01-03 was sampled with an Austenburg Piston sampler in shallow water off the end of the McCormick bulkhead (former dock).
60				

O:\MCCORMICK\MCCORMICK_OA01\SEDIMENT RD\BORE LOGS 020501\BSED01-03.BOR



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LOG OF BORING B-SED01-03


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Data Validation Memoranda

DATA VALIDATION
MEMORANDUM

DATE: February 14, 2001

TO: Peter Geiger, Task Manager, E & E, Portland

FROM: Heather Brunelle, E & E, Portland 

SUBJ: Data Validation of North Creek Analytical, Inc. Analytical Data
McCormick & Baxter Creosoting Company Site
Portland, Oregon

REF: Project Number: 000749.OA01.00.07.96.02
Laboratory Job Number: P1A0246

Sample Matrix: Three sediment samples.

Sample Nos.:

P1A0246-18 (MBSED01-18)
P1A0246-20 (MBSED01-20)
P1A0246-26 (MBSED01-26)

The analytical data provided by North Creek Analytical, Inc. (NCA) were reviewed for laboratory precision, accuracy, and completeness. All data were deemed acceptable as reported.

Three sediment samples were collected and analyzed for the following analyses: semi-volatile organic compounds (SVOCs), including carcinogenic polyaromatic hydrocarbons (PAHs). The data was in accordance with the current edition of Quality Assurance (QA)/Quality Control (QC) guidance outlined in the United States Environmental Protection Agency's (EPA's) Test Methods for Evaluating Solid Waste (EPA SW-846) and the most current editions of the EPA's Functional Guidelines for Reviewing Organic Analyses, as they apply to analyses conducted outside the EPA's Contract Laboratory Program (CLP).

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample

generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container wall, co-precipitation with particulates or volatilization through leaks in the container.

REVIEW RESULTS:

Holding time limits:

SVOCs:

soil - 14 days for extraction, 40 days for analysis

All samples were extracted and analyzed within the required holding times.

2.0 GAS CHROMATOGRAPH/MASS SPECTROMETER (GC/MS) TUNING

Prior to sample analysis, GC/MS tuning is carried out on the analytical instrumentation using decafluorotriphenylphosphine (DFTPP) for the SVOCs fraction. For this compound, certain ions in their mass spectra must be present in specific amounts to ensure the resolution, identifications, and sensitivity of the system. The failure of the laboratory to meet GC/MS tuning criteria indicates that deficiencies exist with the GC/MS system being used.

REVIEW RESULTS:

All tuning check compounds mass abundances and ratios were within required limits for SVOCs analysis.

3.0 INITIAL CALIBRATION

Prior to sample analysis, the GC/MS system is calibrated initially at five concentrations for each PCP and PAH target compound to determine the linearity of response. For each compound, an Average Relative Response Factor (RRF) is determined, which is later used for compound quantitation in sample results. A Relative Standard Deviation (RSD) for the average RRF also is calculated and must be less than the established QC percentage value. Low RRF values and high RSD values are indicative of unsatisfactory instrument calibration; the system may not be capable of acceptable performance for compounds exhibiting such deficiencies.

REVIEW RESULTS:

All criteria for initial calibration were achieved for the SVOCs analysis.

4.0 CONTINUING CALIBRATION

The GC/MS initial calibration must be verified each 12-hour period for a GC/MS system; continuing calibration results check satisfactory maintenance and adjustment on a day-to-day basis.

A continuing calibration RRF value is calculated for each target compound list (TCL) compound, and this value is compared to the initial calibration average RRF value. Continuing calibration compound results with low RRF values and/or RRFs with high percent difference values indicate the instrument is no longer correctly calibrated for these compounds

REVIEW RESULTS:

All criteria for the continuing calibration were achieved for SVOCs analysis.

5.0 BLANKS

Laboratory method blank samples are evaluated to assess the existence and magnitude of possible contamination. Comparison of sample results to compound concentrations found in blanks makes it possible to determine if these compounds were actually present in the sample or were introduced as a contaminant during some phase of the analytical procedure.

REVIEW RESULTS:

Frequency criteria were met for laboratory blank analysis.

No contaminants were detected in any of the laboratory blanks.

6.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effect exists, resulting in similarly low or high sample results for other compounds as well.

REVIEW RESULTS:

All surrogate percent recovery values were within laboratory QC criteria for all analysis, with the exception of the surrogate recovery of 2,4,6-tribromophenol (139% recovery compared to a 122% recovery upper limit) for the analysis of P1A0246-26. No action was taken because only one surrogate recovery was outside limits.

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

The MS/MSD analysis is designed to evaluate possible effects of the inherent sample matrix on target analyte recovery. To assess the possible matrix effect, specific analytes are spiked into a selected sample and a duplicate of that sample. The spike recoveries and relative percent difference (RPD) between the sample and the duplicate are then determined. Poor spike recoveries and high

RPD values may indicate that a significant matrix effect is present and is adversely affecting sample results for that particular matrix or sample medium.

REVIEW RESULTS:

All MS and MSD percent recovery values met laboratory QC guidelines.

8.0 INTERNAL STANDARDS PERFORMANCE

The VOC and SVOC TCL analytes identified in samples are quantified using internal standards that are spiked at specific concentrations into each sample. The retention times and chromatogram peak areas for the internal standards in each sample must fall within established QC limits to ensure that sample quantitation is correct.

REVIEW RESULTS:

All internal standards were within established QC.

9.0 COMPOUND IDENTIFICATION

9.1 SVOCs Analysis

The presence of all compounds found in samples is verified by comparing the mass spectra for the sample compounds to those of the calibration standards run through the GC/MS systems. Retention times for sample compounds are also checked and should match retention times established by the calibration standards. If a sample compound does not meet these criteria, its identification should be rejected.

REVIEW RESULTS:

All criteria for compound identification were achieved for the SVOCs analyses.

DATA QUALIFIERS

- ND - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- U - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- J - The analyte was analyzed for and was positively identified, but the associated numerical value may not be consistent with the amount actually present in the environmental sample. The data should be seriously considered for decision-making and are usable for many purposes.

DATA VALIDATION
MEMORANDUM

DATE: January 5, 2000

TO: Peter Geiger, Task Manager, E & E, Portland

FROM: Heather Brunelle, E & E, Portland *HB*

SUBJ: Data Validation of Oregon Analytical Laboratory Analytical Data
McCormick & Baxter Creosoting Company Site
Portland, Oregon

REF: Project Number: 000749.OA01.00.07.96
Laboratory Job Number: L13502

Sample Matrix: Six sediment samples.

Sample Nos.:

L13502-6	L13502-9
L13502-7	L13502-10
L13502-8	L13502-11

The analytical data provided by Oregon Analytical Laboratory (OAL) were reviewed for laboratory precision, accuracy, and completeness. All data were deemed acceptable as reported.

Six sediment samples were collected and analyzed for the following analyses: pentachlorophenol (PCP) and carcinogenic polycyclic aromatic hydrocarbons (PAHs). The data was in accordance with the current edition of Quality Assurance (QA)/Quality Control (QC) guidance outlined in the United States Environmental Protection Agency's (EPA's) Test Methods for Evaluating Solid Waste (EPA SW-846) and the most current editions of the EPA's Functional Guidelines for Reviewing Organic Analyses, as they apply to analyses conducted outside the EPA's Contract Laboratory Program (CLP).

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample

generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container wall, co-precipitation with particulates or volatilization through leaks in the container.

REVIEW RESULTS:

Holding time limits:

PCP and PAHs:

soil - 14 days for extraction, 40 days for analysis

All samples were extracted and analyzed within the required holding times.

2.0 GAS CHROMATOGRAPH/MASS SPECTROMETER (GC/MS) TUNING

Prior to sample analysis, GC/MS tuning is carried out on the analytical instrumentation using decafluorotriphenylphosphine (DFTPP) for the PCP and PAH fraction. For this compound, certain ions in their mass spectra must be present in specific amounts to ensure the resolution, identifications, and sensitivity of the system. The failure of the laboratory to meet GC/MS tuning criteria indicates that deficiencies exist with the GC/MS system being used.

REVIEW RESULTS:

All tuning check compounds mass abundances and ratios were within required limits for PCP and PAH analysis

3.0 INITIAL CALIBRATION

Prior to sample analysis, the GC/MS system is calibrated initially at five concentrations for each PCP and PAH target compound to determine the linearity of response. For each compound, an Average Relative Response Factor (RRF) is determined, which is later used for compound quantitation in sample results. A Relative Standard Deviation (RSD) for the average RRF also is calculated and must be less than the established QC percentage value. Low RRF values and high RSD values are indicative of unsatisfactory instrument calibration; the system may not be capable of acceptable performance for compounds exhibiting such deficiencies.

REVIEW RESULTS:

All criteria for initial calibration were achieved for the PCP and PAH analysis

4.0 CONTINUING CALIBRATION

The GC/MS initial calibration must be verified each 12-hour period for a GC/MS system; continuing calibration results check satisfactory maintenance and adjustment on a day-to-day basis. A continuing calibration RRF value is calculated for each TCL compound, and this value is compared to the initial calibration average RRF value. Continuing calibration compound results with low RRF values and/or RRFs with high percent difference values indicate the instrument is no longer correctly calibrated for these compounds

REVIEW RESULTS:

All criteria for the continuing calibration for PCP and PAH analysis.

5.0 BLANKS

Laboratory method blank samples are evaluated to assess the existence and magnitude of possible contamination. Comparison of sample results to compound concentrations found in blanks makes it possible to determine if these compounds were actually present in the sample or were introduced as a contaminant during some phase of the analytical procedure.

REVIEW RESULTS:

Frequency criteria were met for laboratory blank analysis.

No contaminants were detected in any of the laboratory blanks.

6.0 SURROGATE SPIKE RECOVERY

Laboratory performance for individual samples is established by means of surrogate spiking activities. Samples are spiked with surrogate compounds prior to preparation and analysis. Unusually low or high surrogate recovery values may indicate some deficiency in the analytical system or that some matrix effect exists, resulting in similarly low or high sample results for other compounds as well.

REVIEW RESULTS:

All surrogate percent recovery values were within laboratory QC criteria for all analysis.

7.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

The MS/MSD analysis is designed to evaluate possible effects of the inherent sample matrix on target analyte recovery. To assess the possible matrix effect, specific analytes are spiked into a selected sample and a duplicate of that sample. The spike recoveries and relative percent difference (RPD) between the sample and the duplicate are then determined. Poor spike recoveries and high

RPD values may indicate that a significant matrix effect is present and is adversely affecting sample results for that particular matrix or sample medium.

REVIEW RESULTS:

All MS and MSD percent recovery values met laboratory QC guidelines.

8.0 INTERNAL STANDARDS PERFORMANCE

The VOC and SVOC TCL analytes identified in samples are quantified using internal standards that are spiked at specific concentrations into each sample. The retention times and chromatogram peak areas for the internal standards in each sample must fall within established QC limits to ensure that sample quantitation is correct.

REVIEW RESULTS:

All internal standards were within established QC.

9.0 COMPOUND IDENTIFICATION

9.1 PCP and PAH Analysis

The presence of all compounds found in samples is verified by comparing the mass spectra for the sample compounds to those of the calibration standards run through the GC/MS systems. Retention times for sample compounds are also checked and should match retention times established by the calibration standards. If a sample compound does not meet these criteria, its identification should be rejected.

REVIEW RESULTS:

All criteria for compound identification were achieved for both the PCP and PAH analyses.

DATA QUALIFIERS

- ND - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- U - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- J - The analyte was analyzed for and was positively identified, but the associated numerical value may not be consistent with the amount actually present in the environmental sample. The data should be seriously considered for decision-making and are usable for many purposes.

DATA VALIDATION
MEMORANDUM

DATE: January 5, 2000

TO: Peter Geiger, Task Manager, E & E, Portland

FROM: Heather Brunelle, E & E, Portland *HB*

SUBJ: Data Validation of Oregon Analytical Laboratory Analytical Data
McCormick & Baxter Creosoting Company Site
Portland, Oregon

REF: Project Number: 000749.OA01.00.07.96
Laboratory Job Number: L13502

Sample Matrix: Six sediment samples.

Sample Nos.:

L13502-19	L13502-25
L13502-23	L13502-26
L13502-24	L13502-27

The analytical data provided by Oregon Analytical Laboratory (OAL) were reviewed for laboratory precision, accuracy, and completeness. All data were deemed acceptable as reported.

Six sediment samples were collected and analyzed for arsenic. The data was in accordance with the current edition of Quality Assurance (QA)/Quality Control (QC) guidance outlined in the United States Environmental Protection Agency's (EPA's) Test Methods for Evaluating Solid Waste (EPA SW-846) and the most current editions of the EPA's Functional Guidelines for Reviewing Inorganic Analyses, as they apply to analyses conducted outside the EPA's Contract Laboratory Program (CLP).

I. ARSENIC DATA

1.0 HOLDING TIMES

Holding times are established and monitored to ensure analytical results accurately represent analyte concentrations in a sample at the time of collection. Exceeding the holding time for a sample generally results in a loss of the analyte due to a variety of mechanisms, such as deposition on the sample container walls or precipitation.

REVIEW RESULTS:

Holding time limits:

Metals - 6 months

All samples met holding criteria.

2.0 INITIAL AND CONTINUING CALIBRATION VERIFICATION

Initial and continuing calibration verification solutions contain known concentrations of target analytes and are repeatedly checked at the beginning of analyses (initial) and throughout a sample batch run (continuing). Instrument accuracy and stability are documented during calibrations. Accuracy is determined by the percent recovery (%R) of known standards during the initial calibration. Stability is measured by the %R of known standards during the continuing calibration. The inability of the laboratory to perform acceptably on the calibration criteria may indicate that problems exist in the laboratory's analytical system. Associated sample data generated under such conditions should be considered suspect.

REVIEW RESULTS:

The QC criteria for initial and continuing calibration for As were achieved.

3.0 BLANKS

Laboratory blank samples are analyzed and evaluated to determine the existence and magnitude of possible contamination. Generally, if analyte concentrations greater than the LDL for a given analyte are found in a laboratory blank, it is likely that the analyte is present as a contaminant in some phase of the analysis procedure and associated sample concentrations may be biased high.

REVIEW RESULTS:

The QC criteria for initial and continuing calibration blanks for As were achieved.

4.0 MATRIX SPIKE SAMPLE ANALYSIS

The spiked sample analysis also is designed to provide information about the effect of the sample matrix on the digestion and measurement methodology. Sample spike recovery values that do not meet laboratory QC criteria may indicate that sample analyte results are being attenuated in the analysis procedure. It is possible to estimate the bias of other sample results by noting the degree to which the spike concentration was elevated or lowered in the spike analysis. However, these bias results should serve as approximations; sample-specific problems may be the cause of the discrepancy, particularly in soil samples.

REVIEW RESULTS:

The matrix spike percent recovery (%R) values were within laboratory QC limits.

5.0 DUPLICATE SAMPLE ANALYSIS

Duplicate samples are analyzed to evaluate the precision of the sample results. The failure of the laboratory to reproduce similar results for a duplicate sample may indicate that the sample was non-homogeneous (particularly in soil samples), or method defects exist in laboratory techniques.

REVIEW RESULTS

The relative percent difference (RPD) values were within QC criteria.

7.0 LABORATORY CONTROL SAMPLE ANALYSIS

The laboratory control sample (LCS) is analyzed to serve as a monitor of the efficiency of the digestion procedure. The inability of the laboratory to successfully analyze an LCS is indicative of an analytical problem related to the digestion/sample preparation procedures and/or instrument operations.

REVIEW RESULTS:

All LCS analyses for sediment were within control limits.

DATA QUALIFIERS

- ND - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- U - The material was analyzed for, but was not detected. The associated numerical value is a method quantitation limit adjusted for sample weight/sample volume, extraction volume, percent solids and sample dilution.
- J - The analyte was analyzed for and was positively identified, but the associated numerical value may not be consistent with the amount actually present in the environmental sample.

The data should be seriously considered for decision-making and are usable for many purposes.

MEMORANDUM

DATE: January 3, 2000

TO: Peter Geiger, Project Manager, Portland, OR

FROM: David A. Ikeda, Chemist, E & E, Seattle, WA

THRU: Heather Brunelle, Chemist, E & E, Portland, WA *HB*

SUBJ: **Organic Data Quality Assurance Review, McCormick and Baxter Site,
Portland, Oregon**

REF: 749.OA01.00.08

The data quality assurance review of twelve sediment samples collected from the McCormick and Baxter site located in Portland, Oregon, has been completed. Analysis for Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) following a modified EPA Method 8290 for were performed by Pace Analytical Services, Inc of Minneapolis, Minnesota.

The samples were numbered:

MBSE099-05	MBSE099-18	MBSE099-25
MBSE099-11	MBSE099-19	MBSE099-33
MBSE099-14	MBSE099-21	MBSE099-37
MBSE099-16	MBSE099-22	MBSE099-50

Data Qualifications:

I Holding Time: Acceptable.

The samples were maintained at 4°C. The samples were collected between October 12 and 18, 1999; extracted by October 25, 1999, and analyzed by November 4, 1999, therefore meeting QC criteria of less than 30 days between collection and extraction, and less than 45 days between extraction and analysis.

II Instrument Performance: Acceptable.

A performance check solution was analyzed at the beginning of each 12-hour sample analysis period. The minimum resolving power of 10,000 was attained. The valley between 2,3,7,8-TCDD and the peaks representing all other TCDD isomers was $\leq 25\%$ in the window defining mix solution. All ion abundance

and retention time criteria were met in all calibration standards.

III Calibration

A. Initial Calibration: Acceptable.

A 5-point initial calibration was performed with all Relative Standard Deviations (RSDs) less than 20 % for the unlabeled target analytes and less than 30 % for the labeled internal standards. All ion abundance ratios, signal-to-noise (s/n) ratios, and retention times were within method QC limits.

B. Continuing Calibration: Acceptable.

A continuing calibration was analyzed at the start of each 12-hour period. The % valley between 2,3,7,8-TCDD and the closest TCDF isomer was less than 25 %. The retention times for all of the furan and dioxin homologues were established and properly labeled from the first to the last eluters. All ion abundance and s/n ratios were within method QC limits. All % difference (%D) values were less than 30 % for the labeled internal standards and less than 20 % for the unlabeled target analytes.

IV Blanks: Acceptable.

The frequency of analysis of laboratory blanks was met. No target analytes were detected in any blanks.

V Internal Standards: Satisfactory.

All internal standard (IS) ion abundance ratios were within method QC limits. All IS percent recovery (%R) values were within the QC limits.

VI Surrogate Recoveries: Not Applicable.

Surrogates were not required for this method. Clean-up standard 37Cl-2,3,7,8-TCDD was added to all samples and QC samples. The clean-up standard recoveries were acceptable.

VII Duplicate Sample Analysis: Not Applicable.

Duplicate sample analyses were not performed and no action was taken on this basis.

VIII Matrix Spike/Matrix Spike Duplicates: Not Applicable.

The laboratory did not analyze a matrix spike or matrix spike duplicate sample. No action was taken on this basis.

IX Analytical Sequence: Acceptable.

All of the standards, blanks, samples and QC samples were analyzed in accordance with the method-specified analytical sequence.

X Laboratory Control Sample (LCS) Analyses: Acceptable.

A spiked blank was extracted and analyzed with each sample delivery group (SDG). The percent recovery values for the target compounds and internal standards for the LCS and LCSD were within QC

criteria.

The relative percent difference (RPD) values between the LCS and LCSD were within laboratory QC limits.

XI Compound Identification: Acceptable.

For analytes with isotopically labeled standards, the retention times of the sample quantitation ions maximized within -1 to +3 seconds of the isotopically labeled standard ions. All samples had ratios for the quantitation ion integrated ion currents within the method QC limits.

XII Compound Quantitation and Detection Limits: Acceptable.

All of the samples were analyzed at the project required quantitation limits. All of the compounds were calculated off the primary column, DB5, except for TCDF, which was calculated from a second column. In several samples, the laboratory could not quantitate 2,3,7,8-TCDF, because of other TCDF isomers. The sample results were qualified as estimated (J).

All of the detected target compounds were within the linear calibration range. In several samples, compound identification and/or quantitation may be unconfirmed or biased high due to polychlorinated diphenyl ethers interferences. The sample quantitation limits or positive results were flagged as estimated (UJ or J).

XIII Laboratory Contact: Required

The laboratory was contacted on December 17, 1999, for a discrepancy with calculating 1,2,3,7,8,9-HxCDD. The laboratory calculates 1,2,3,7,8,9-HxCDD, by the average of the two internal HxCDD standards. No action was taken for this discrepancy.

XIV Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in EPA Method 8290 and the OSWER Directive "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures" (EPA/540/G-90/004). Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or because quality control criteria limits were not met.
- UJ - The material was analyzed for, but not detected. The reported detection limit is estimated because Quality Control criteria were not met.



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International Specialists in the Environment

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MEMORANDUM

DATE: January 19, 2001

TO: Pete Geiger, Project Manager, Ecology and Environment, Inc., Portland, OR

FROM: Mark Woodke, Ecology and Environment, Inc., Seattle, WA *MW*

SUBJ: **Bioassay Data Quality Assurance Review, McCormick and Baxter Site, Portland, Oregon**

REF: 000749.OA01.00.08

The data quality assurance review of 43 sediment samples collected from the McCormick and Baxter site located in Portland, Oregon, has been completed. Ten day freshwater sediment bioassay analyses for the amphipod (*hyalella azteca*) and midge (*chironomid tentans*) were performed according to ASTM Method E 1706-95b from the *Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates* by CH₂M Hill, Corvallis, Oregon.

The samples were numbered MBSED99-01 through -39 and L13502-52 through-56. The "MBSED99" sample numbers were inadvertently listed as "MSSED99" by the laboratory; these numbers were not corrected on the result pages by the reviewer.

Data Qualifications:

The sediment samples were collected between October 12 and 19, 1999, and were analyzed in several batches between October 18 and November 19, 1999. Recommended criteria of less than 14 days between sediment sample collection and the start of the bioassay analyses were generally met; the outliers for this recommendation in the *hyalella azteca* tests were not qualified on this basis. The sediment samples were received at 7°C to 14°C, all greater than the recommended temperatures of 4°C ± 2°C; all sample results were qualified as estimated quantities (J) based on these outliers. The water used during the tests was reconstituted moderately hard water with a total hardness of 98 to 104 mg/L as CaCO₃, an alkalinity of 68 to 78 mg/L as CaCO₃, and a pH of 7.9 to 8.3. The hardness, alkalinity, pH, and ammonia in the overlying water did not vary more than 50% during the tests except some ammonia results; associated sample results were previously qualified as estimated quantities (J). The temperatures averaged 23°C ± 1°C during the tests and the instantaneous temperatures were within 23°C ± 3°C. Daily dissolved oxygen measurements were within 40% to 100% saturation for the duration of the tests. Large debris was removed by hand prior to testing which was performed in eight replicates with 10 organisms per replicate. The reference sediment was used as the control standard. The overlying dilution water was renewed every 12 hours. The water was monitored for dissolved oxygen, ph, conductivity, ammonia, alkalinity, and hardness at the beginning and end of the test periods. Dissolved oxygen and temperature were also monitored every 24 hours during the tests. Reference toxicant tests performed in October and November were within the expected sensitivity ranges for each test.

Hyalella azteca 10-day survival test

Prior to the tests, 50 grams of sediment and 100 mLs of water were added to the test vessels and were allowed to stand overnight. The overlying water was renewed the next morning, then the test organisms were added. All animals at the initiation of the tests were between 7 and 14 days old and appeared in good condition at test initiation. The mean control survival was at least 80% upon test termination except the test performed between October 18 and 28, 1999; the test was repeated between November 9 and 19, 1999; the November results were reported by the laboratory.

Chironomus tentans 10-day survival and growth test

Prior to the tests, 100 grams of sediment and 175 mLs of water were added to the test vessels and were allowed to stand overnight. The overlying water was renewed the next morning, then the test organisms were added. Fifty percent of the test animals were third instar or younger with head capsule widths between 0.33 millimeters and 0.45 millimeters. The mean control survival was at least 70% upon test termination. The mean size of the control animals was at least 0.6 milligrams upon test termination.

The overall usefulness of the data is based on the criteria outlined in the "Portland Harbor Sediment Management Plan - Appendix G, Public Review Draft (April 1999)" and ASTM Method E 1706-95b *Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates*. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - The associated numerical value is an estimated quantity because quality control criteria limits were not met.

RESULTS AND DISCUSSION

SEDIMENT BIOASSAYS

The raw data sheets are presented in Appendix A and the results are summarized in the tables below. Tables 1 and 2 summarize the survival data from the *Hyalella azteca* tests.

Table 1 Summary of Results <i>Hyalella azteca</i> Test date 11/1/99			
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival
	Lab Control	138/160	86.3
	Sediment Control	154/160	96.3
MSED99-32	CO2434-14	69/80	86.3 J
MSED99-35	CO2434-23	70/80	87.5
MSED99-34	CO2434-20	73/80	91.3
MSED99-16	CO2434-25	74/80	92.5
MSED99-17	CO2434-26	0/80	0.0 ^a
MSED99-20	CO2434-27	69/80	86.3
MSED99-21	CO2434-28	77/80	96.3
MSED99-23	CO2434-29	79/80	98.8
MSED99-39	CO2434-30	78/80	97.5
MSED99-36	CO2434-31	74/80	92.5
MSED99-19	CO2434-32	75/80	96.3
MSED99-38	CO2434-33	70/80	87.5
MSED99-18	CO2434-34	77/80	96.3
MSED99-10	CO2434-35	77/80	96.3
MSED99-13	CO2434-36	76/80	95.0
MSED99-11	CO2434-37	75/80	93.8
MSED99-09	CO2434-38	70/80	88.8
MSED99-14	CO2434-39	69/80	86.3
L13502-52	CO2434-40	78/80	97.5
L13502-54	CO2434-41	78/80	97.5
L13502-55	CO2434-42	73/80	91.3
L13502-56	CO2434-43	79/80	98.8 V
^a Indicates a statistically significant reduction from Lab control at p less than 0.05 using Wilcoxon Two sample Test.			

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Table 2 summarizes the survival data from the *Hyaella azteca* test conducted 11/9/99:

Table 2 Summary of Results <i>Hyaella azteca</i> Test date 11/9/99			
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival
	Lab Control	130/160	81.3
	Sediment Control	134/160	83.8
MSED99-01	CO2434-01	73/80	91.3
MSED99-02	CO2434-02	76/80	95.0
MSED99-03	CO2434-03	57/80	71.3 ^a
MSED99-04	CO2434-04	28/80	35.0 ^a
MSED99-05	CO2434-05	60/80	75.0
MSED99-06	CO2434-06	66/80	82.5
MSED99-07	CO2434-07	22/80	27.5 ^a
MSED99-37	CO2434-08	66/80	82.5
MSED99-22	CO2434-09	62/80	77.5
MSED99-33	CO2434-10	66/80	82.5
MSED99-28	CO2434-11	57/80	71.3
MSED99-24	CO2434-12	58/80	72.5
MSED99-25	CO2434-13	73/80	91.3
MSED99-12	CO2434-22	38/80	47.5 ^a
MSED99-26	CO2434-15	56/80	70.0 ^a
MSED99-27	CO2434-16	49/80	61.3 ^a
MSED99-29	CO2434-17	51/80	63.8 ^a
MSED99-30	CO2434-18	68/80	85.0
MSED99-31	CO2434-19	58/80	72.5
MSED99-15	CO2434-24	44/80	55.0 ^a
MSED99-08	CO2434-21	0/80	0.0 ^a ✓
^a Indicates a statistically significant reduction from Lab control at p less than 0.05 using Wilcoxon Two sample Test.			

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Tables 3 and 4 summarize the survival data from the *Chironomus tentans* tests.

Table 3 Summary of Results <i>Chironomus tentans</i> Test date 10/19/99				
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival	Weight (mg)
	Lab Control	123/160	76.9	1.26
MSED99-01	CO2434-01	63/80	78.8	1.40
MSED99-02	CO2434-02	63/80	78.8	1.55
MSED99-03	CO2434-03	61/80	76.3	1.40
MSED99-04	CO2434-04	66/80	82.5	1.34
MSED99-05	CO2434-05	65/80	81.3	1.46
MSED99-06	CO2434-06	69/80	86.3	1.78
MSED99-07	CO2434-07	68/80	85.0	0.92 ^a
MSED99-37	CO2434-08	73/80	91.3	1.15 ^a
MSED99-22	CO2434-09	71/80	88.8	1.17
MSED99-33	CO2434-10	72/80	90.0	1.50
MSED99-28	CO2434-11	72/80	88.8	1.22
MSED99-24	CO2434-12	72/80	86.3	1.90
MSED99-25	CO2434-13	68/80	85.0	1.84
MSED99-12	CO2434-22	74/80	92.5	1.69
MSED99-26	CO2434-15	74/80	90.0	1.87
MSED99-27	CO2434-16	78/80	95.0	1.88
MSED99-29	CO2434-17	65/80	81.3	1.85
MSED99-30	CO2434-18	75/80	92.5	1.78
MSED99-31	CO2434-19	68/80	85.0	1.82
MSED99-15	CO2434-24	74/80	92.5	1.67
MSED99-08	CO2434-21	68/80	85.0	1.19
^a Indicates a statistically significant reduction from control at p less than 0.05 using Wilcoxon Two-Sample Test.				

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Table 4
Summary of Results
Chironomus tentans
 Test date 11/2/99

OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival	Weight (mg)
	Lab Control	127/160	79.4	1.05
MSED99-32	CO2434-14	72/80	90.0	1.46
MSED99-35	CO2434-23	73/80	88.8	1.28
MSED99-34	CO2434-20	75/80	85.0	1.06
MSED99-16	CO2434-25	76/80	95.0	1.21
MSED99-17	CO2434-26	2/80	2.5 ^a	0.01 ^a
MSED99-20	CO2434-27	59/80	73.8	0.31 ^a
MSED99-21	CO2434-28	61/80	76.3	0.96
MSED99-23	CO2434-29	56/80	70.0	1.08
MSED99-39	CO2434-30	73/80	88.8	1.23
MSED99-36	CO2434-31	73/80	91.3	1.26
MSED99-19	CO2434-32	73/80	91.3	1.68
MSED99-38	CO2434-33	75/80	93.8	1.04
MSED99-18	CO2434-34	74/80	95.0	1.47
MSED99-10	CO2434-35	67/80	83.8	1.12
MSED99-13	CO2434-36	70/80	87.5	0.26 ^a
MSED99-11	CO2434-37	73/80	88.8	1.12
MSED99-09	CO2434-38	63/80	78.8	1.35
MSED99-14	CO2434-39	71/80	88.8	1.28
L13502-52	CO2434-40	68/80	85.0	1.56
L13502-54	CO2434-41	50/80	62.5 ^a	1.20
L13502-55	CO2434-42	61/80	76.3	1.28
L13502-56	CO2434-43	55/80	68.8	1.19

^a Indicates a statistically significant reduction from control at p less than 0.05 using Wilcoxon Two-Sample Test.

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REFERENCE TOXICANT TESTS

The 48-hour LC_{50} value and 95-percent confidence intervals for the reference toxicant tests (cadmium for *Hyalella azteca* and potassium chloride for *Chironomus tentans*) conducted in October and November are listed below. The results indicate that the organisms were within their expected sensitivity range.

Table 5 Reference Toxicant Tests		
Species	LC_{50}	95% C.I.
<i>Chironomus tentans</i> (Chi 05)	4.2 g/L	1.0 to 5.2 g/L
<i>Chironomus tentans</i> (Chi 06)	4.9 g/L	1.0 to 5.8 g/L
<i>Hyalella azteca</i> (Amp 36)	3.6 μ g/l	0.6 to 19.5 μ g/l
<i>Hyalella azteca</i> (Amp 38)	6.5 μ g/l	0.5 to 19.2 μ g/l

MW
1-15-01



ecology and environment, inc.

International Specialists in the Environment

2101 Fourth Avenue, Suite 1900, Seattle, WA 98121

Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: February 15, 2001

TO: Pete Geiger, Project Manager, Ecology and Environment, Inc., Portland, OR

FROM: Mark Woodke, Ecology and Environment, Inc., Seattle, WA *MW*

THRU: David Ikeda, Ecology and Environment, Inc., Seattle, WA *DI*

SUBJ: **Bioassay Data Quality Assurance Review, McCormick and Baxter Site, Portland, Oregon**

REF: 000749.OA01.00.08

The data quality assurance review of 18 sediment samples collected from the McCormick and Baxter site located in Portland, Oregon, has been completed. Ten day freshwater sediment bioassay analyses for the amphipod (*hyalella azteca*) and midge (*chironomid tentans*) were performed in accordance with Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates, EPA/600/R-99/064, March 2000, by MEC Analytical Systems, Tiburon, California.

Data Qualifications:

The sediment samples were collected between January 5 and 8, 2001, and were analyzed between January 19 and 29, 2001. Recommended criteria of less than 14 days between sediment sample collection and the start of the bioassay analyses were met. The sample receipt temperature was not listed by the laboratory; it is assumed by the data reviewer that all samples were maintained within the recommended temperatures of $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The water used during the tests was moderately hard mineral water that was replenished twice daily. The hardness, alkalinity, pH, and ammonia in the overlying water did not vary more than 50 % during the tests except for some ammonia results; no action was taken based on these outliers. The temperatures averaged $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$ during the tests and the instantaneous temperatures were within $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$. Daily dissolved oxygen measurements were within control limits except on day 5 of the midge test; the tests were aerated and acceptable dissolved oxygen levels were restored, therefore no action was taken based on these outliers. Testing was performed in eight replicates with 10 organisms per replicate. The reference sediment was used as the control standard. The overlying dilution water was renewed every 12 hours. The water was monitored for dissolved oxygen, pH, conductivity, ammonia, alkalinity, and hardness at the beginning and end of the test periods. Dissolved oxygen and temperature were also monitored every 24 hours during the tests. Reference toxicant tests were within the expected sensitivity ranges for each test.

Hyaella azteca 10-day survival test

All animals at the initiation of the tests were 8 days old and appeared in good condition. Two control analyses were performed, but organisms were inadvertently not loaded into replicate 1 of control sample 1, therefore all samples were compared to control sample 2. The mean control survival was at least 80 % upon test termination.

Chironomus tentans 10-day survival and growth test

All of the test animals were third instar; head capsule widths were not provided. The mean control survival was at least 70 % upon test termination. The mean size of the control animals was at least 0.6 milligrams upon test termination.

The overall usefulness of the data is based on the criteria outlined in the "Portland Harbor Sediment Management Plan - Appendix G, Public Review Draft (April 1999)" and "*Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*", EPA/600/R-99/064, March 2000. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

TABLE 1

SUMMARY REPORT FOR A 10-DAY SOLID-PHASE SEDIMENT BIOASSAY

Test Dates: 19 January - 29 January 2001

Report Issued by:
MEC Analytical Systems, Inc.
Bioassay Division
98 Main St #428
Tiburon, CA 94920

Report Issued to:
Ecology and Environment, Inc.
3335 W. Fifth Avenue, Suite 608
Portland, OR 97204

REPORT DATE: 02/08/01
PROJECT #: 0555-033

SAMPLE AND BIOASSAY INFORMATION

TEST INFORMATION

Control Water: Moderately Hard Water
(Diluted mineral water)
Exposure volume: 100 mL sediment;
300 mL Mod water
Test chambers: 500 mL glass jar
Concentrations (%): 100
Organisms/chamber: 10

SPECIES INFORMATION

Species: *Hyallela azteca*
Source: Aquatic Biosystems
Fort Collins, CO
Age: 8 days

SAMPLE INFORMATION

Sample Type: Sediment
Client Sample ID: SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,
-11,-28,-22,-21,-09,-26
Client PO: 133671-C10
Sample Date: 1/5/01 - 1/8/01
Sample Received: 1/10/01
MEC Sample ID #: T010110.03 through .20

TEST SUMMARY

Client Sample ID	MEC Sample ID	Mean Survival (%)	Water Quality Summary (Min./Max.)							Ammonia	
			Temp. (°C)	pH (units)	DO (mg/L)	Cond (uS/cm)	Alk (mg/L)	Hard (mg/L)		Overlying (mg/L)	Pore (mg/L)
Control	T010110.03	87.5 ± 9.7	21.9/23.8	7.99/8.00	4.6/8.5	209/262	90/98	92/92		0.17/2.02	0.57/2.74
SED01- 27	T010110.04	82.5 ± 9.7	22.0/23.5	7.00/7.50	3.1/8.0	155/189	84/100	78/102		1.07/2.02	1.96/3.80
SED01- 16	T010110.05	91.3 ± 6.0	22.0/23.8	7.26/7.76	4.4/6.6	181/192	84/100	86/98		0.11/0.57	0.84/0.86
SED01- 15	T010110.06	81.3 ± 13.6	21.8/23.7	7.07/7.56	4.6/6.7	158/175	86/110	88/100		0.11/2.02	0.38/0.85
SED01- 01	T010110.07	86.3 ± 13.2	21.7/23.2	7.00/7.54	4.6/7.0	235/244	104/106	94/100		0.20/1.49	0.57/1.28
SED01- 07	T010110.08	28.8* ± 16.2	21.5/23.1	7.00/7.44	4.2/6.5	167/282	88/102	90/92		3.13/3.19	8.20/12.2
SED01- 24	T010110.09	86.3 ± 8.6	21.6/23.1	7.25/7.66	4.8/6.2	180/222	98/100	92/100		0.33/0.97	0.84/1.35
SED01- 19	T010110.10	78.8 ± 13.6	21.8/23.1	7.61/7.69	4.8/7.0	175/179	92/106	86/98		0.11/1.06	0.32/1.38
SED01- 12	T010110.11	67.5 ± 17.9	21.5/23.1	7.67/7.75	4.8/6.6	201/221	92/112	102/108		0.11/1.09	0.22/0.84
SED01- 05	T010110.12	81.3 ± 8.7	21.9/23.1	7.08/7.56	4.6/6.2	158/188	78/114	82/102		1.19/2.44	3.37/3.69
SED01- 29	T010110.13	8.8* ± 7.8	21.7/23.1	7.24/7.51	4.6/6.4	160/163	86/110	84/100		1.38/2.34	2.40/3.73
SED01- 18	T010110.14	81.3 ± 11.7	21.6/23.3	7.23/7.46	4.4/6.3	153/176	84/90	82/84		1.43/1.81	3.52/6.88
SED01- 30	T010110.15	90.0 ± 8.7	21.6/24.0	7.29/7.49	4.3/6.7	165/178	90/98	92/98		0.26/1.32	0.51/1.60
SED01- 11	T010110.16	87.5 ± 9.7	22.0/23.6	7.22/7.55	4.7/7.1	151/156	80/112	100/102		0.34/1.70	1.70/2.48
SED01- 28	T010110.17	90.0 ± 7.1	22.0/23.5	6.99/7.52	4.7/6.6	161/163	76/104	82/92		0.64/2.24	3.23/3.26
SED01- 22	T010110.18	88.8 ± 10.5	22.0/23.5	7.30/7.56	4.4/6.7	189/235	94/100	98/98		0.37/0.80	1.17/3.00
SED01- 21	T010110.19	80.0 ± 10.0	22.2/23.8	7.39/7.60	4.8/6.6	153/179	86/100	78/98		<0.01/0.64	0.42/1.35
SED01- 09	T010110.20	83.8 ± 7.0	22.0/23.8	7.10/7.59	4.7/6.6	158/168	90/104	90/92		0.26/1.55	0.51/1.29
SED01- 26	T010110.21	80.0 ± 13.2	22.0/23.6	7.14/7.88	4.6/6.8	188/204	94/112	86/106		0.27/2.11	0.91/2.33

REFERENCE TOXICANT SUMMARY

Reference Toxicant: Copper as copper sulfate
Concentrations: 125, 250, 500, 1000 and 2000 ug/L
Organisms/chamber: 10
Exposure volume: 200 mL
Test chambers: 250 mL beakers

Conc. (ug/L)	Mean % Survival
Control	90
125	40
250	13
500	0
1000	0
2000	0

LC50 (mg/L): 118.5
Lab Mean LC50: 380.1 +/- 275.1
Sensitivity: Normal

Reference: U.S. EPA, Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064, March 2000.

* - Significantly different from the controls ($\alpha = 0.05$)

Mr 2-14-01

TABLE 3

SUMMARY REPORT FOR A 10-DAY SOLID-PHASE SEDIMENT BIOASSAY

Test Dates: 19 January - 29 January 2001

Report Issued by:
MEC Analytical Systems, Inc.
Bioassay Division
98 Main St. #428
Tiburon, CA 94920

Report Issued to:
Ecology and Environment, Inc.
3335 W. Fifth Avenue, Suite 608
Portland, OR 97204

REPORT DATE: 02/08/01
PROJECT #: 0555-051

SAMPLE AND BIOASSAY INFORMATION

TEST INFORMATION

Control Water: Moderately Hard Water
(Diluted mineral water)
Exposure volume: 300 mL sediment;
600 mL Mod water
Test chambers: 1L glass jar
Concentrations (%): 100
Organisms/chamber: 10

SPECIES INFORMATION

Species: *Chironomus tentans*
Source: Aquatic Biosystems
Fort Collins, CO
Age: Third instar larvae

SAMPLE INFORMATION

Sample Type: Sediment
Client Sample ID: SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,
-11,-28,-22,-21,-09,-26
Client PO: 133671-C10
Sample Date: 1/5/01 - 1/8/01
Sample Received: 1/10/01
MEC Sample ID #: T010110.03 through .20

TEST SUMMARY

Client Sample ID	MEC Sample ID	Mean Survival (%)	Mean Ash Free Dry Weight (mg)	Water Quality Summary (Min./Max.)							Ammonia	
				Temp. (°C)	pH (units)	DO (mg/L)	Cond (uS/cm)	Alk (mg/L)	Hard (mg/L)		Overlying (mg/L)	Pore (mg/L)
Control 1	T010110.03	71.3 ± 17.6	1.39 ± 0.50	22.0/23.2	7.66/7.95	2.5/8.4	237/250	90/98	92/92		0.17/2.02	0.57/2.74
SED01- 27	T010110.04	77.5 ± 13.9	1.31 ± 0.34	22.0/23.8	7.62/7.81	1.8/8.3	193/195	84/100	78/102		1.07/2.02	1.96/3.80
SED01- 16	T010110.05	82.5 ± 13.9	1.76 ± 0.72	21.6/24.0	7.61/7.68	2.5/8.1	194/219	84/100	86/98		0.11/0.57	0.84/0.86
SED01- 15	T010110.06	73.8 ± 16.5	2.01 ± 0.25	21.6/23.7	7.34/8.07	2.0/8.1	169/187	86/110	88/100		0.11/2.02	0.38/0.85
SED01- 01	T010110.07	75.0 ± 7.1	1.57 ± 0.46	21.8/23.6	7.21/8.07	2.6/7.4	201/231	104/106	94/100		0.20/1.49	0.57/1.28
SED01- 07	T010110.08	12.5* ± 10.9	0.30* ± 0.26	21.5/23.5	7.19/7.78	2.8/8.0	169/187	88/102	90/92		3.13/3.19	8.20/12.2
SED01- 24	T010110.09	65.0 ± 14.1	1.15 ± 0.32	21.6/23.7	7.44/8.11	2.6/7.9	206/209	98/100	92/100		0.33/0.97	0.84/1.35
SED01- 19	T010110.10	86.3 ± 8.6	1.43 ± 0.47	22.0/23.4	7.41/7.89	2.8/7.2	165/185	92/106	86/98		0.11/1.06	0.32/1.38
SED01- 12	T010110.11	52.5 ± 17.1	1.31 ± 0.25	21.6/23.4	7.48/7.56	1.3/8.2	189/224	92/112	102/108		0.11/1.09	0.22/0.84
SED01- 05	T010110.12	72.5 ± 10.9	1.42 ± 0.24	22.0/23.5	7.26/8.09	2.6/7.4	170/171	78/114	82/102		1.19/2.44	3.37/3.69
Control 2	T010110.03	70.0 ± 15.0	1.26 ± 0.49	21.5/23.4	7.71/8.12	2.9/8.5	234/269	90/98	92/92		0.17/2.02	0.57/2.74
SED01- 29	T010110.13	0*	NA	21.7/23.5	7.35/8.15	2.8/7.6	166/196	86/110	84/100		1.38/2.34	2.40/3.73
SED01- 18	T010110.14	75.0 ± 17.3	1.47 ± 0.36	21.5/23.5	7.17/8.01	1.8/8.4	170/173	84/90	82/84		1.43/1.81	3.52/6.88
SED01- 30	T010110.15	68.8 ± 16.2	1.59 ± 0.20	21.3/23.6	7.29/8.19	2.9/8.6	164/211	90/98	92/98		0.26/1.32	0.51/1.60
SED01- 11	T010110.16	63.8 ± 16.5	1.18 ± 0.24	21.8/23.5	7.33/8.07	2.6/8.6	156/200	80/112	100/102		0.34/1.70	1.70/2.48
SED01- 28	T010110.17	68.8 ± 16.2	1.05 ± 0.25	22.0/23.5	7.20/8.13	2.6/8.2	162/179	76/104	82/92		0.64/2.24	3.23/3.26
SED01- 22	T010110.18	65.0 ± 10.0	1.04 ± 0.13	22.0/23.5	7.28/8.09	2.5/8.2	214/225	94/100	98/98		0.37/0.80	1.17/3.00
SED01- 21	T010110.19	76.3 ± 25.0	1.68 ± 0.50	22.0/23.4	7.22/8.14	1.8/8.5	159/197	86/100	78/98		<0.01/0.64	0.42/1.35
SED01- 09	T010110.20	56.3 ± 18.0	1.06 ± 0.30	22.0/23.3	7.16/7.34	1.1/8.3	158/217	90/104	90/92		0.26/1.55	0.51/1.29
SED01- 26	T010110.21	51.3 ± 28.5	0.62* ± 0.34	21.9/23.2	7.24/8.11	1.6/8.0	184/210	94/112	86/106		0.27/2.11	0.91/2.33

* - Significantly different from the controls (α = 0.05)

REFERENCE TOXICANT SUMMARY

Reference Toxicant: Copper as copper sulfate
Concentrations: 250, 500, 1000, 2000 and 4000 ug/L
Organisms/chamber: 1
Exposure volume: 20 mL
Test chambers: 25 mL plastic cups

Conc. (ug/L)	Mean % Survival
Control	80
250	70
500	50
1000	60
2000	50
4000	30

LC50 (mg/L): 2000
Lab Mean LC50: 1003 ± 725.4
Sensitivity: Normal

Reference: U.S. EPA, Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064, March 2000.

MW 2/4/01

D

Laboratory Data Reports



Ecology & Environment, Inc.

Project: 000749.OA01.00.07.96
McCormick & Baxter

Attached Data Sheets

For

GRAIN SIZE

By ASTM D 422

OREGON ANALYTICAL LABORATORY

A Division of Portland General Electric
14855 S.W. Scholls Ferry Road, Beaverton, OR 97007
Phone 503-590-5300 • Fax 503-590-1404
www.oalab.com • Toll-Free 1-800-644-0967

SIEVE ANALYSIS

Date : November 8, 1999

SAMPLE	Sieve analysis on portion coarser than #10 sieve								Sieve Analysis on portion finer than #10 sieve							
	3"	2"	1 1/2"	1"	3/4"	3/8"	#4	#10	#20	#30	#40	#60	#80	#100	#140	#200
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing	passing
99-0414-01	99.67	99.67	99.67	99.67	99.67	99.67	99.67	99.65	98.46	96.54	85.00	85.00	80.38	1.99	49.23	12.31
99-0414-02	99.85	99.85	99.85	99.85	99.85	99.85	99.85	99.85	97.10	96.23	90.43	90.43	85.80	2.88	48.70	14.78
99-0414-03	99.79	99.79	99.79	99.79	99.79	99.79	99.79	99.79	107.87	106.74	100.00	100.00	94.38	2.12	42.70	16.85
99-0414-04	99.57	99.57	99.57	99.57	99.57	98.92	98.34	97.68	93.55	81.57	18.43	18.43	15.10	2.07	7.73	1.13
99-0414-05	98.97	98.97	98.97	98.97	97.10	94.81	91.98	89.95	97.29	89.26	11.49	11.49	5.71	1.72	1.33	0.00
99-0414-06	98.20	98.20	98.20	98.20	98.20	96.82	94.04	91.32	95.65	87.96	28.17	28.17	19.06	5.90	5.59	0.82
99-0414-07	98.56	98.56	98.56	98.56	98.56	97.74	95.42	93.17	91.23	75.82	9.90	9.90	5.99	1.78	1.91	0.18
99-0414-08	99.25	99.25	99.25	99.25	99.25	99.12	98.64	98.07	107.65	105.73	53.70	53.70	35.46	4.13	18.05	9.02
99-0414-09	99.92	87.62	87.62	87.62	86.60	83.89	80.63	78.48	96.66	91.61	17.56	17.56	5.17	0.99	0.46	0.08
99-0414-10	82.88	82.88	82.88	82.88	82.72	81.24	79.16	76.95	93.07	82.91	12.50	12.50	4.61	0.91	0.53	0.09
99-0414-11	87.74	87.74	87.74	87.74	87.74	81.16	64.87	45.47	62.19	45.73	6.81	6.81	2.32	0.74	0.23	0.06
99-0414-12	99.89	99.89	99.89	99.89	99.89	99.85	99.02	96.74	91.32	77.45	21.73	21.73	18.44	10.43	5.97	1.61
99-0414-13	99.97	96.65	96.65	87.21	84.85	74.31	65.35	58.56	81.59	66.70	5.63	5.63	2.02	0.64	0.38	0.08
99-0414-14	99.79	99.79	99.79	96.94	91.51	70.20	53.69	41.01	69.79	57.81	9.49	9.49	2.19	0.46	0.19	0.06
99-0414-15	99.63	99.63	99.63	99.63	99.63	99.63	99.63	99.49	92.23	91.52	90.03	90.03	84.20	10.85	38.33	12.80
99-0414-16	99.67	99.67	99.67	99.67	99.67	99.61	99.46	98.98	99.14	97.40	74.81	74.81	64.95	20.22	11.45	4.20
99-0414-17	99.51	99.51	99.51	99.51	91.27	84.92	79.54	72.68	90.53	83.36	54.26	54.26	47.10	10.01	13.22	3.49
99-0414-18	99.48	99.48	99.48	99.48	99.48	98.59	97.38	97.10	86.32	59.37	7.85	7.85	2.44	0.36	0.08	0.00
99-0414-19	99.84	99.84	99.84	99.84	98.39	81.44	73.05	71.17	94.69	82.62	13.51	13.51	8.40	2.78	1.64	0.38
99-0414-20	99.49	99.49	99.49	99.49	98.76	97.30	95.79	93.31	98.72	97.48	84.41	84.41	76.12	21.70	20.29	5.73
99-0414-21	99.62	99.62	99.62	99.62	99.62	99.54	99.35	98.88	97.34	95.08	84.71	84.71	80.43	5.77	36.10	11.32
99-0414-22	99.98	99.98	99.98	99.98	99.98	99.98	99.68	99.25	98.90	92.66	11.31	11.31	4.06	2.71	2.04	1.86
99-0414-23	99.56	99.56	99.56	99.56	99.56	99.56	99.20	98.66	99.48	98.40	86.48	86.48	75.71	16.34	18.66	4.71
99-0414-24	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.85	90.11	89.46	80.29	80.29	72.60	16.91	17.10	0.00
99-0414-25	99.75	99.75	99.75	99.75	99.75	99.58	99.10	98.94	99.75	99.31	94.73	94.73	88.83	33.60	24.69	7.32
99-0414-26	99.59	99.59	99.59	99.59	99.59	99.56	99.54	99.53	100.14	99.49	91.96	91.96	84.21	15.48	31.73	10.33
99-0414-27	99.92	99.92	99.92	99.92	99.92	99.92	99.92	99.90	99.63	98.78	88.20	88.20	82.37	9.77	35.79	11.29
99-0414-28	98.42	98.42	98.42	98.42	98.42	98.42	98.16	97.17	93.06	81.93	3.45	3.45	0.44	0.10	0.02	0.00
99-0414-29	99.80	99.80	99.80	99.80	99.80	99.74	99.53	99.38	98.60	98.00	85.85	85.85	70.31	23.71	15.46	3.47
99-0414-30	99.89	99.89	99.89	99.89	99.89	99.89	99.89	99.89	100.00	99.17	91.00	91.00	86.00	8.73	34.33	12.75
99-0414-31	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.60	98.79	91.70	91.70	85.73	7.22	33.60	10.53
99-0414-32	99.89	99.89	99.89	99.89	99.89	99.89	99.89	99.89	99.20	97.96	88.92	88.92	82.71	7.79	35.20	12.06
99-0414-33	99.91	99.91	99.91	99.91	99.91	95.69	91.15	87.75	95.79	88.51	12.77	12.77	4.13	1.08	0.68	0.10
99-0414-34	99.87	99.87	99.87	99.87	99.87	99.87	99.87	99.87	99.40	98.32	89.45	89.45	82.13	5.97	38.13	13.43
99-0414-35	99.81	99.81	99.81	99.81	99.81	99.81	99.81	99.73	96.25	95.30	85.51	85.51	72.91	16.37	17.63	3.80
99-0414-36	99.68	99.68	99.68	99.68	99.68	99.68	99.68	99.68	99.20	98.82	90.98	90.98	83.07	16.69	24.95	5.92
99-0414-37	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.94	98.24	92.03	4.85	4.85	1.37	0.30	0.20	0.06
99-0414-38	99.57	99.57	99.57	99.57	99.57	99.57	99.57	99.57	99.36	97.22	83.97	83.97	79.91	3.29	36.54	11.32
99-0414-39	99.63	99.63	99.63	99.63	99.63	99.63	99.63	99.63	99.07	98.25	89.44	89.44	79.46	14.38	22.13	5.24
99-0414-40	99.91	99.91	99.91	99.91	99.91	99.91	99.91	99.83	98.64	51.47	95.65	76.36	55.36	17.48	10.71	2.42
99-0414-41	99.64	99.64	99.64	99.64	99.64	99.64	99.64	99.64	94.88	40.11	64.27	21.04	10.89	2.75	1.52	0.28
99-0414-42	99.90	99.90	99.90	99.90	99.90	99.90	99.61	99.30	99.41	38.44	86.59	33.49	14.90	3.04	2.07	0.46
99-0414-43	99.85	99.85	99.85	99.85	99.85	99.85	99.85	99.85	90.82	34.70	83.42	49.55	27.19	7.27	4.63	1.05

Nov 22 99 04:39p

Jackie Groves

(503)978-4754

p.2

CROSS REFERENCE LIST FOR GRAIN SIZE ANALYSIS

OAL SAMPLE REFERENCE TAKEN OFF CONTAINER	PSI SAMPLE REFERENCE
MBSED99-01	99-0414-01
MBSED99-02	99-0414-02
MBSED99-03	99-0414-03
MBSED99-04	99-0414-04
MBSED99-05	99-0414-05
MBSED99-06	99-0414-06
MBSED99-07	99-0414-07
MBSED99-08	99-0414-08
MBSED99-09	99-0414-09
MBSED99-10	99-0414-10
MBSED99-11	99-0414-11
MBSED99-12	99-0414-12
MBSED99-13	99-0414-13
MBSED99-14	99-0414-14
MBSED99-15	99-0414-15
MBSED99-16	99-0414-16
MBSED99-17	99-0414-17
MBSED99-18	99-0414-18
MBSED99-19	99-0414-19
MBSED99-20	99-0414-20
MBSED99-21	99-0414-21
MBSED99-22	99-0414-22
MBSED99-23	99-0414-23
MBSED99-24	99-0414-24
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MBSED99-38	99-0414-38
MBSED99-39	99-0414-39
MBSED99-40	99-0414-40
MBSED99-41	99-0414-41
MBSED99-42	99-0414-42
MBSED99-43	99-0414-43

HYDROMETER ANALYSIS REPORT

Sample Identification:

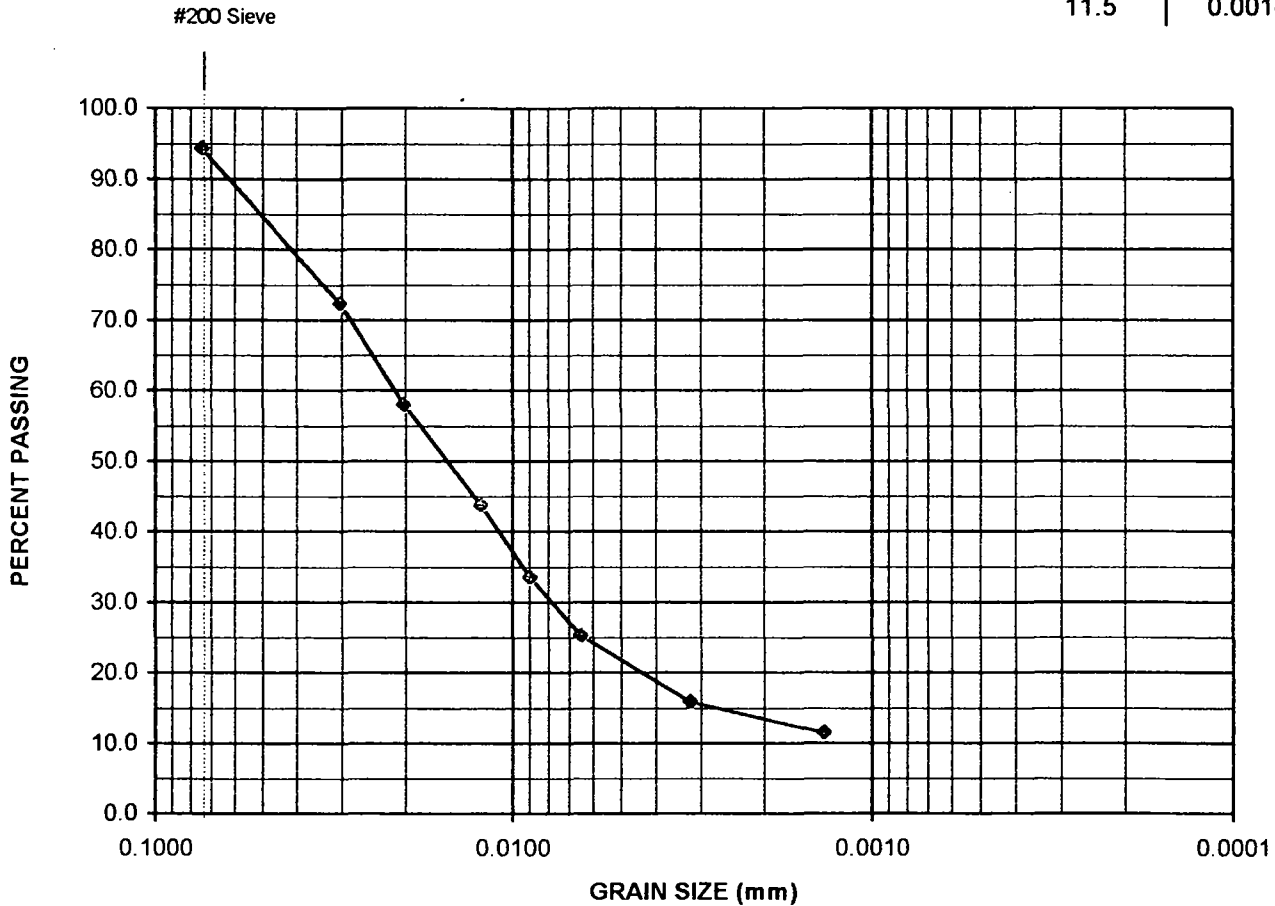
99-0414-01

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.7
Percent passing the No. 200 Sieve: 94.3
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
72.3	0.0300
57.9	0.0201
43.6	0.0122
33.4	0.0089
25.2	0.0065
15.8	0.0032
11.5	0.0014
11.5	0.0014
11.5	0.0014
11.5	0.0014



Report No. 99-0414

Reviewed By: _____

Test conducted according to ASTM D422-63.



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Client

Oregon Analytical Laboratory

Project

688-9T192

Job No.

Date

11.2.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-02

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9
 Percent passing the No. 200 Sieve: 92.6
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
73.6	0.0300
57.0	0.0202
40.3	0.0123
32.0	0.0090
25.7	0.0065
16.1	0.0032
9.0	0.0014
9.6	0.0014
9.6	0.0014
9.6	0.0014



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Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

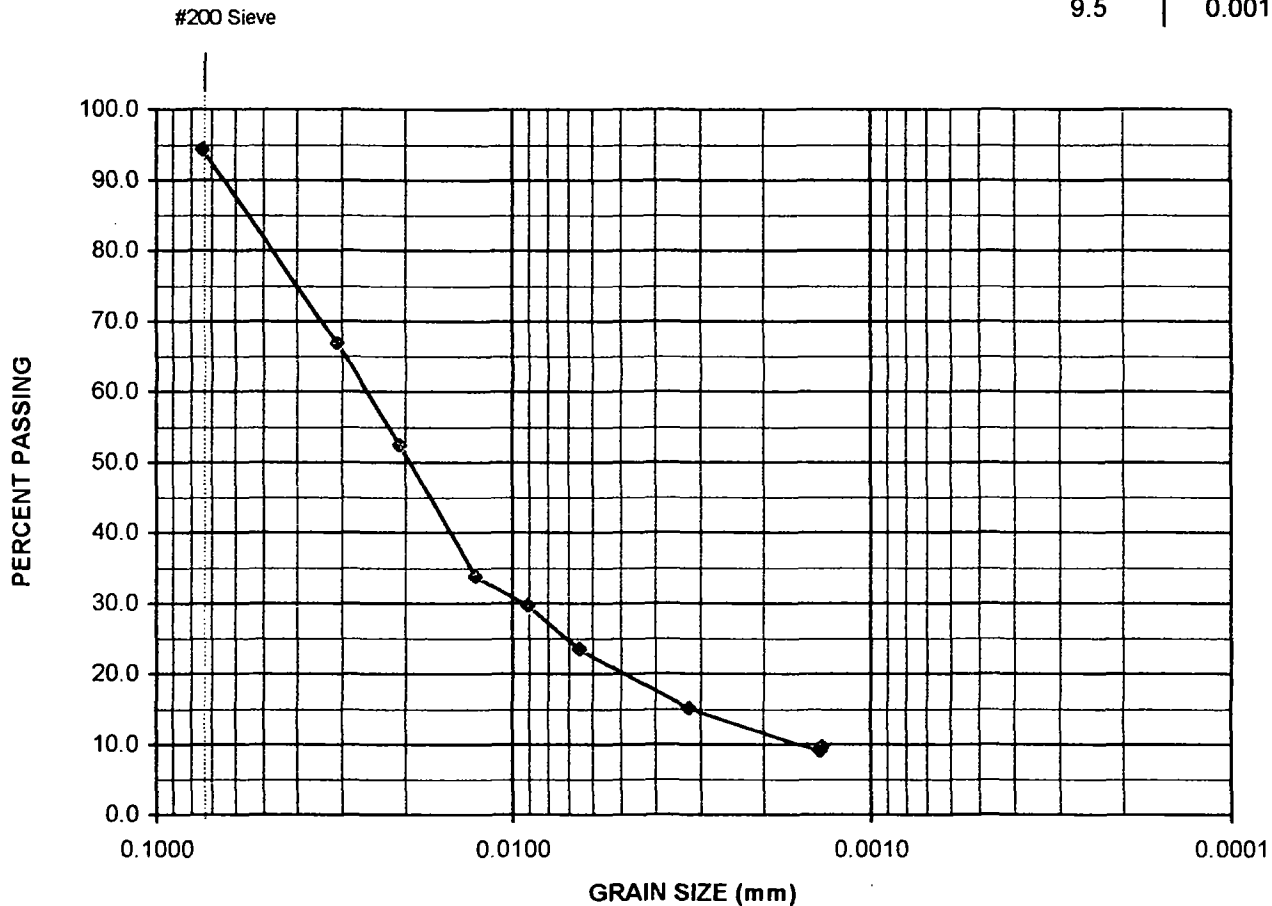
99-0414-03

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.8
Percent passing the No. 200 Sieve: 94.2
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
66.8	0.0308
52.3	0.0205
33.7	0.0126
29.6	0.0090
23.4	0.0065
14.9	0.0032
8.9	0.0014
9.5	0.0014
9.5	0.0014
9.5	0.0014



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Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-04

Sample Description:

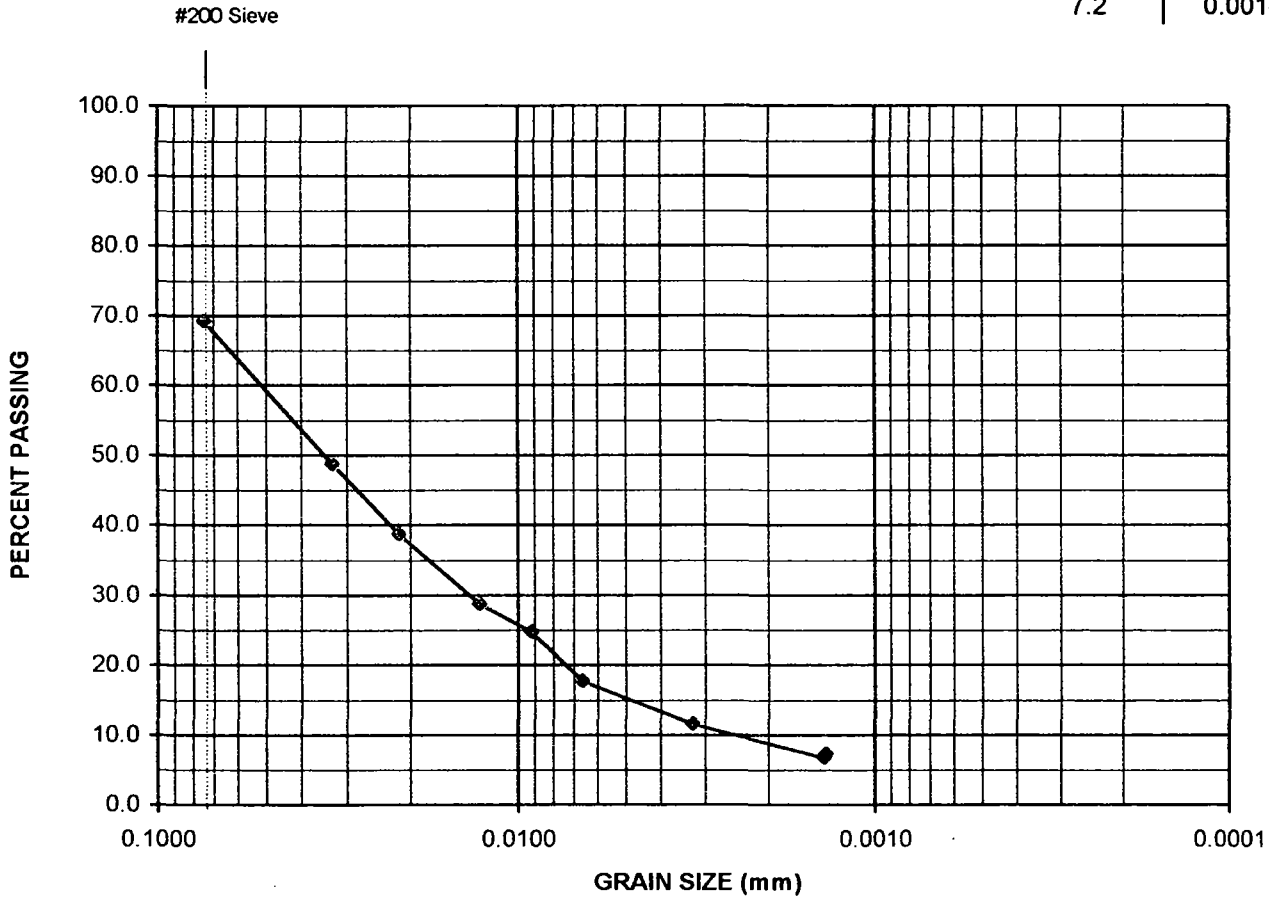
Soil sample

Percent passing the No. 10 Sieve: 97.7

Percent passing the No. 200 Sieve: 69.1

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
48.7	0.0327
38.7	0.0214
28.7	0.0127
24.7	0.0091
17.7	0.0066
11.5	0.0032
6.7	0.0014
7.2	0.0014
7.2	0.0014
7.2	0.0014



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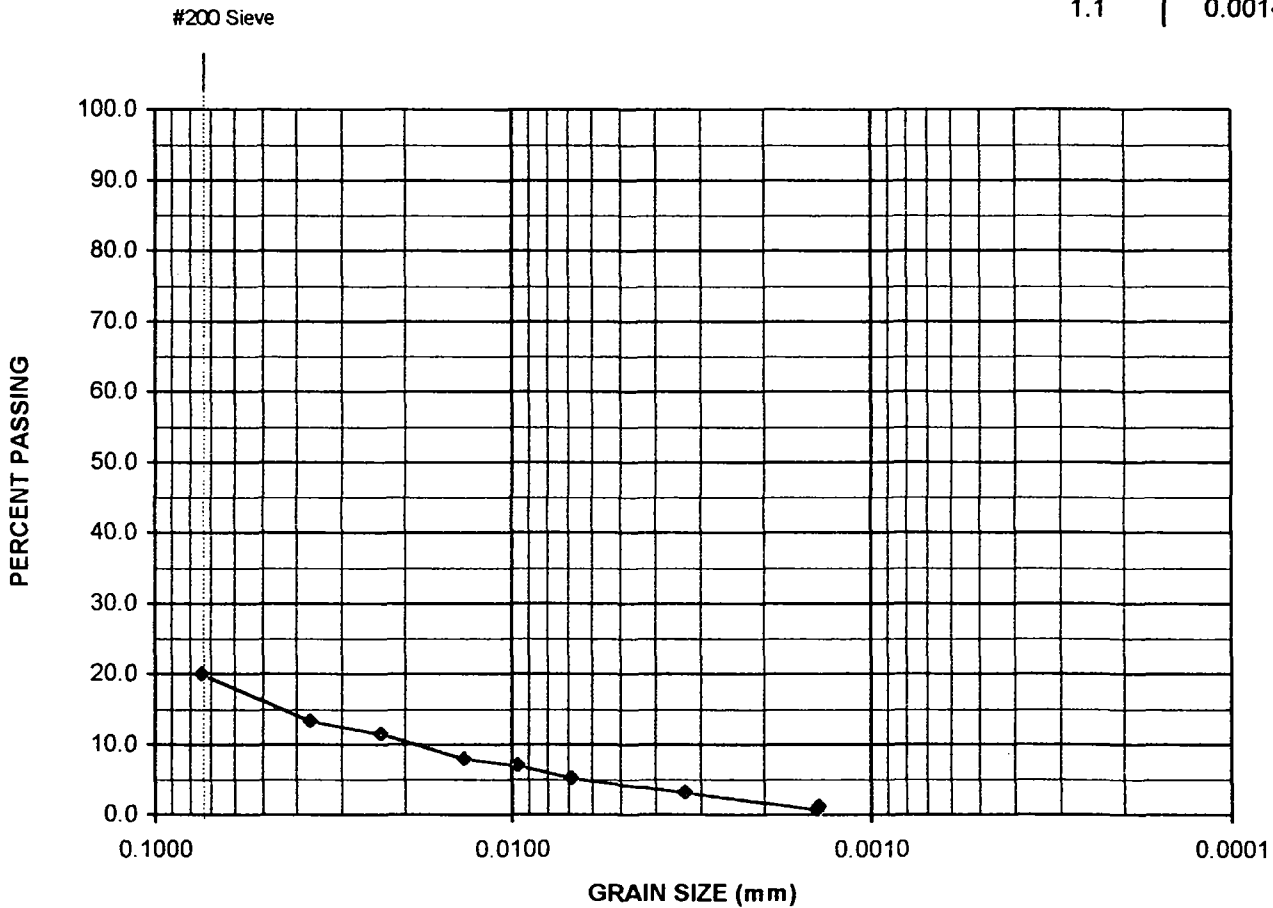
HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-05

Sample Description: Soil sample

		%FINER	D(mm)
Percent passing the No. 10 Sieve:	90.0	13.2	0.0364
		11.4	0.0231
		7.8	0.0135
Percent passing the No. 200 Sieve:	19.9	6.9	0.0096
		5.1	0.0068
		3.1	0.0033
Specific gravity of sample:	2.70 (assumed)	0.6	0.0014
		1.1	0.0014
		1.1	0.0014
		1.1	0.0014



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HYDROMETER ANALYSIS REPORT

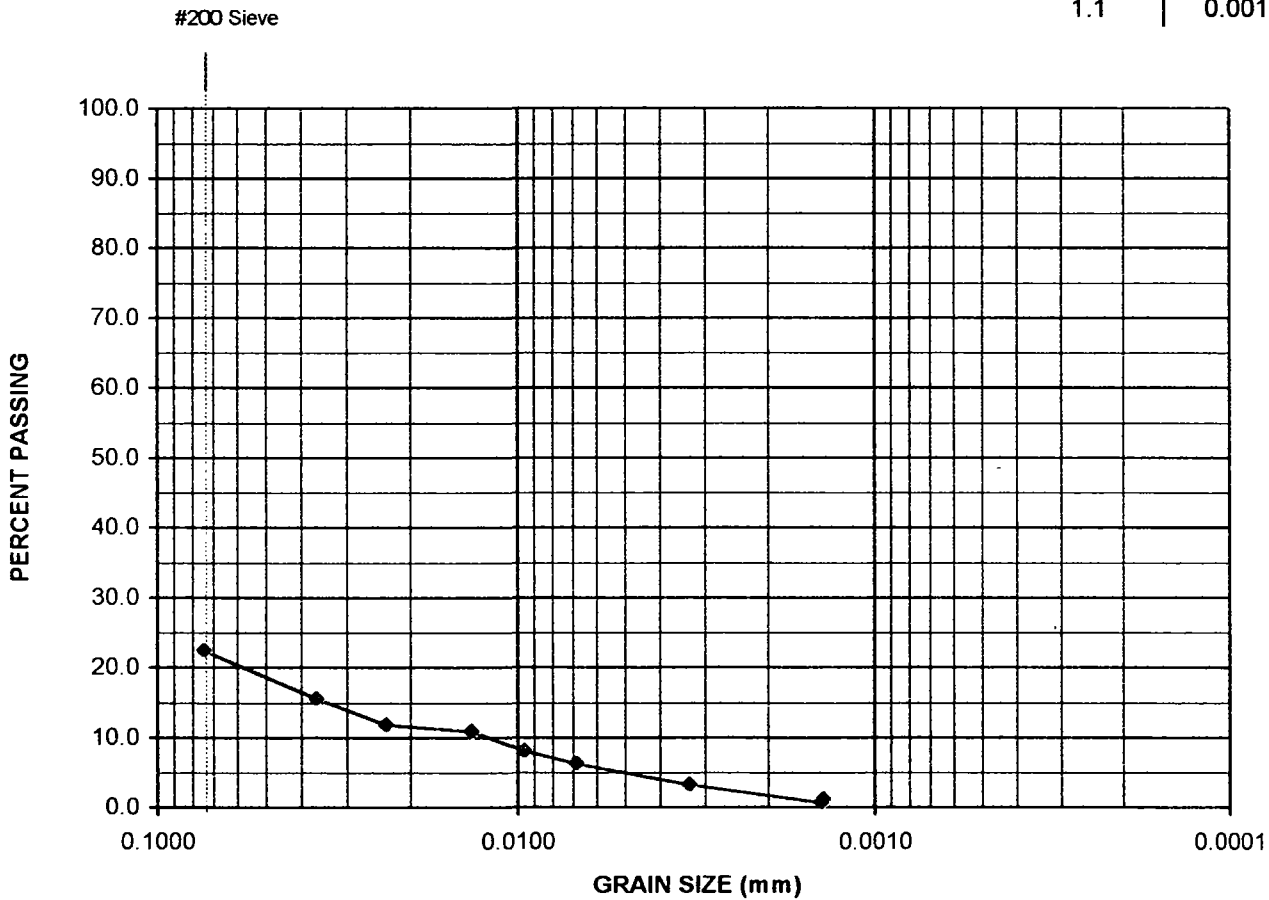
Sample Identification:

99-0414-06

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 91.3
Percent passing the No. 200 Sieve: 22.4
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
15.5	0.0362
11.8	0.0231
10.8	0.0134
8.1	0.0096
6.2	0.0068
3.2	0.0033
0.6	0.0014
1.1	0.0014
1.1	0.0014
1.1	0.0014



Report No. 99-0414

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Date

11.5.99

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Sample Identification:

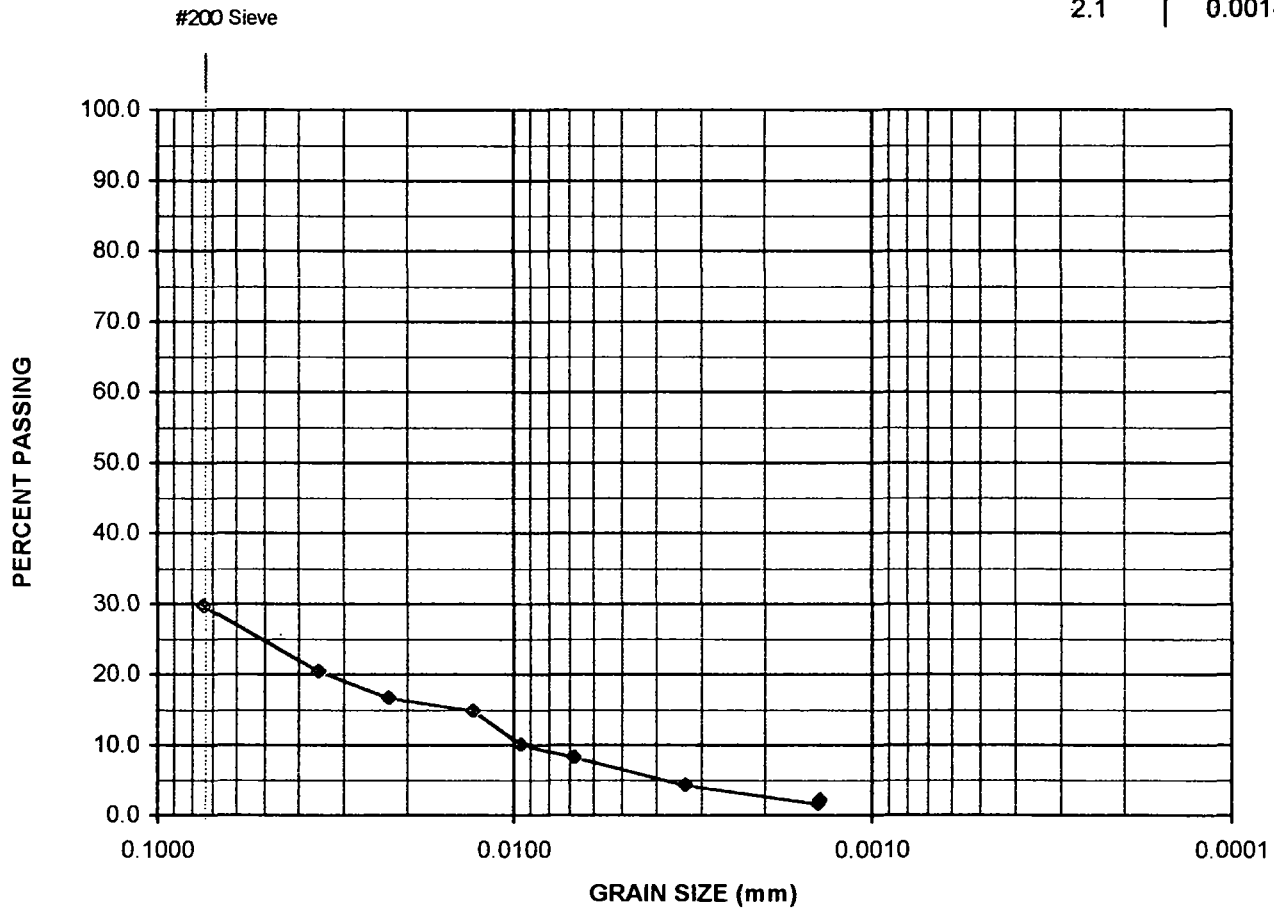
99-0414-07

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 93.2
 Percent passing the No. 200 Sieve: 29.6
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
20.4	0.0349
16.6	0.0223
14.8	0.0130
10.0	0.0095
8.1	0.0068
4.2	0.0033
1.6	0.0014
2.1	0.0014
2.1	0.0014
2.1	0.0014



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Job No.	Date 11.5.99

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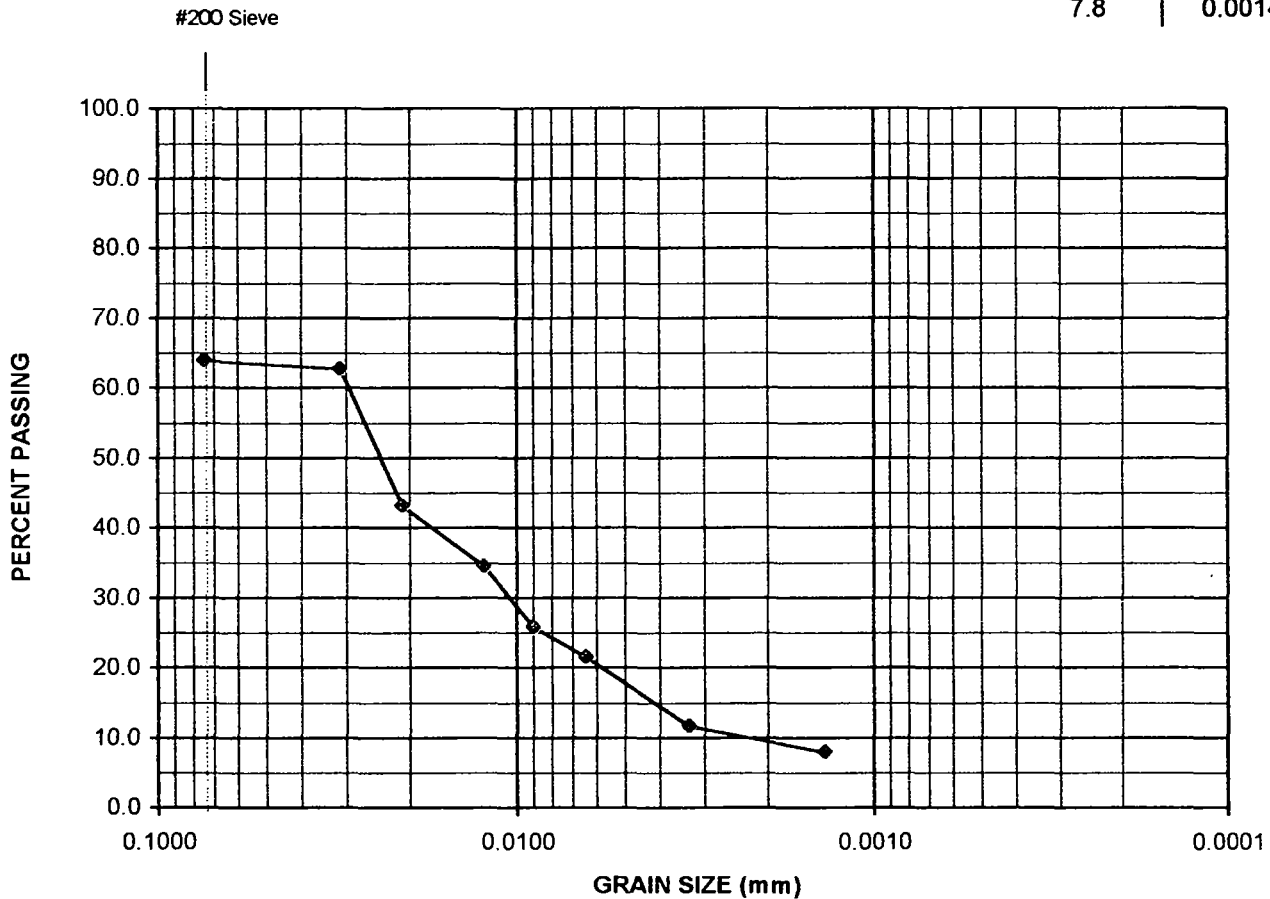
Sample Identification:

99-0414-08

Sample Description:

Soil sample

		%FINER	D(mm)
Percent passing the No. 10 Sieve:	98.1	62.7	0.0310
		43.1	0.0209
		34.5	0.0124
		25.8	0.0090
Percent passing the No. 200 Sieve:	63.8	21.4	0.0064
		11.6	0.0033
Specific gravity of sample:	2.70 (assumed)	7.8	0.0014
		7.8	0.0014
		7.8	0.0014
		7.8	0.0014



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Date

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Sample Identification:

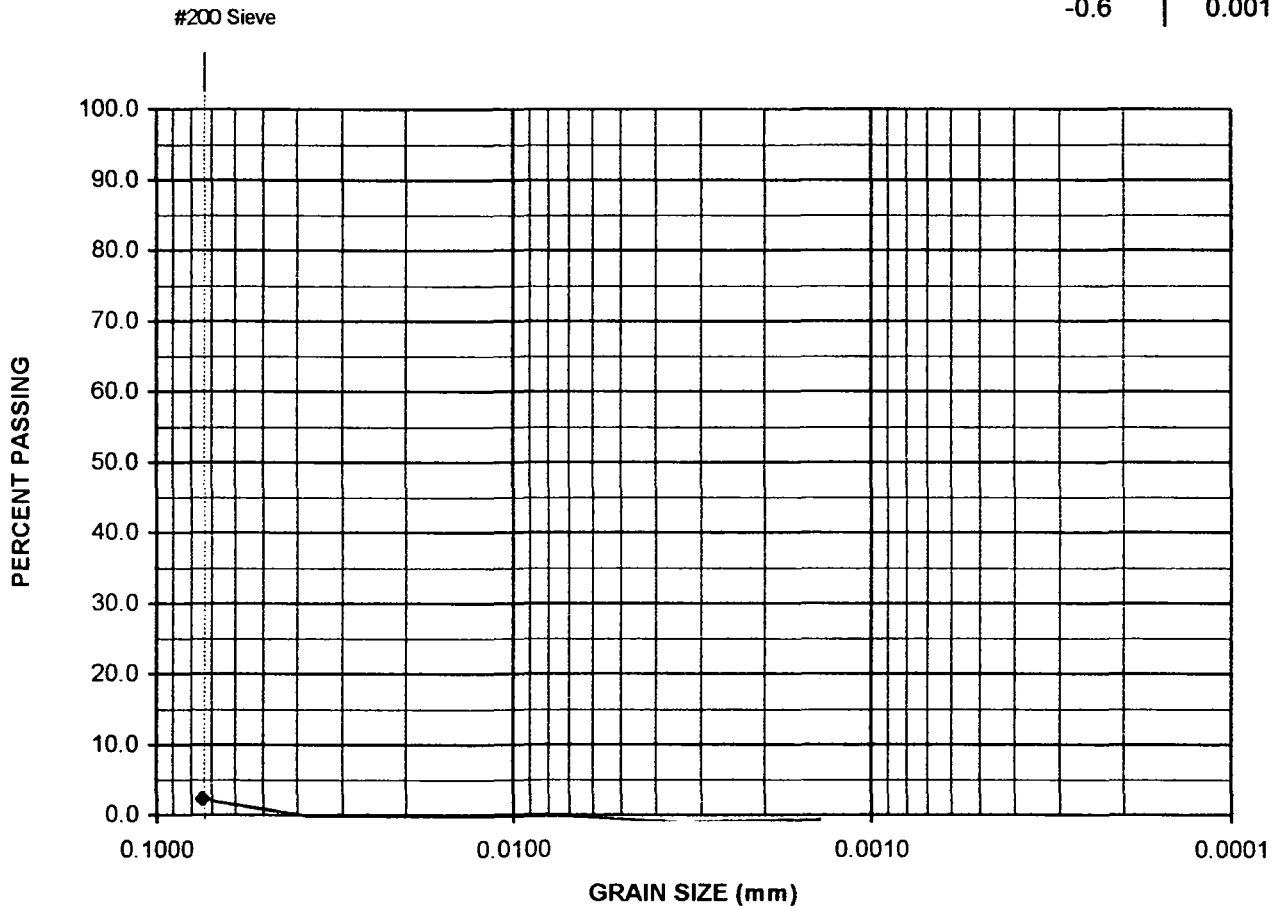
99-0414-09

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 78.5
 Percent passing the No. 200 Sieve: 2.2
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
-0.2	0.0371
-0.2	0.0234
-0.2	0.0135
-0.2	0.0096
-0.2	0.0068
-1.1	0.0034
-0.6	0.0014
-0.6	0.0014
-0.6	0.0014
-0.6	0.0014



Report No. 99-0414

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Job No.

Date

11.5.99

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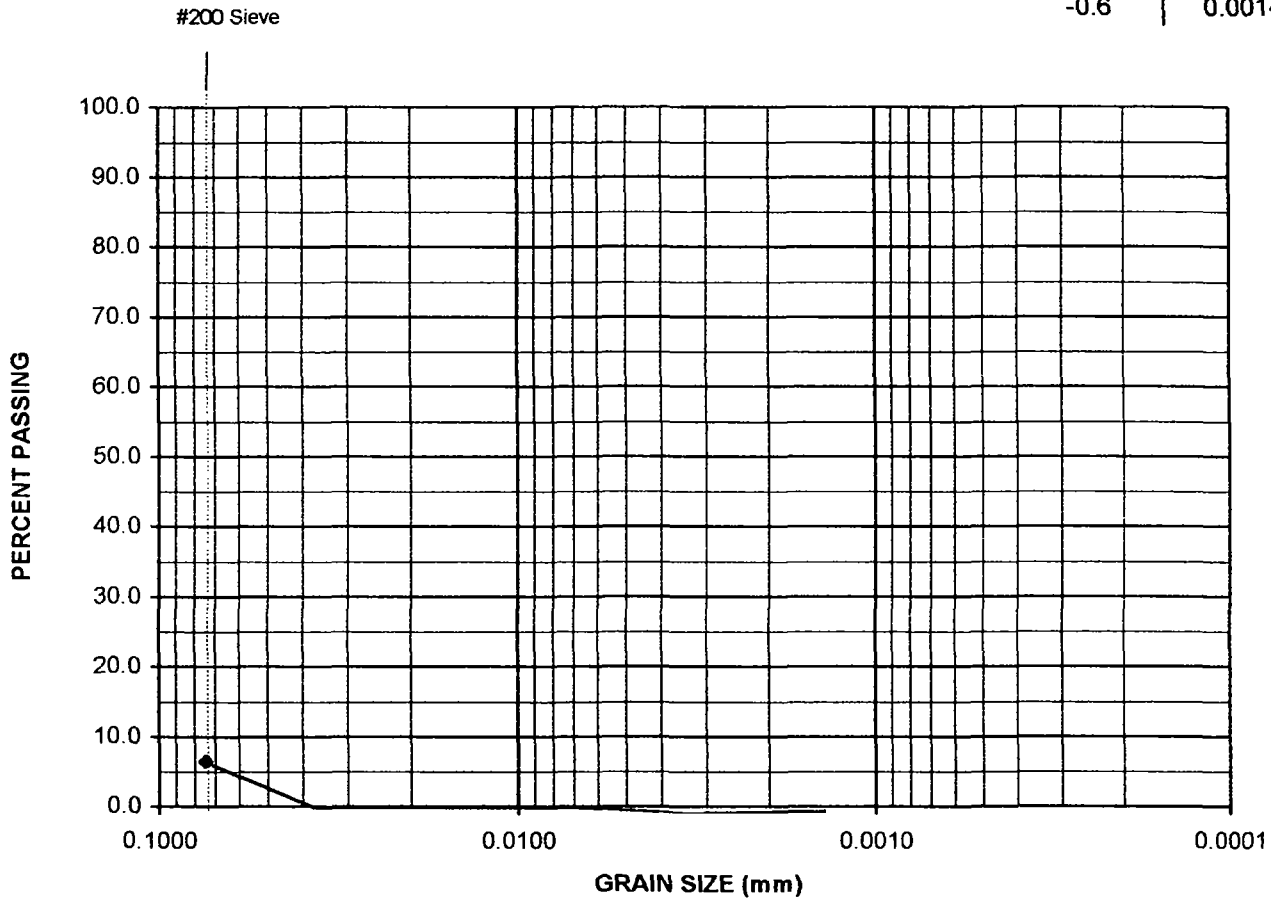
Sample Identification:

99-0414-10

Sample Description:

Soil sample

		%FINER	D(mm)
Percent passing the No. 10 Sieve:	77.0	-0.2	0.0371
		-0.2	0.0234
Percent passing the No. 200 Sieve:	6.3	-0.2	0.0135
		-0.2	0.0096
		-0.2	0.0068
Specific gravity of sample:	2.70 (assumed)	-1.0	0.0034
		-0.6	0.0014
		-0.6	0.0014
		-0.6	0.0014
		-0.6	0.0014



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Project

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Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

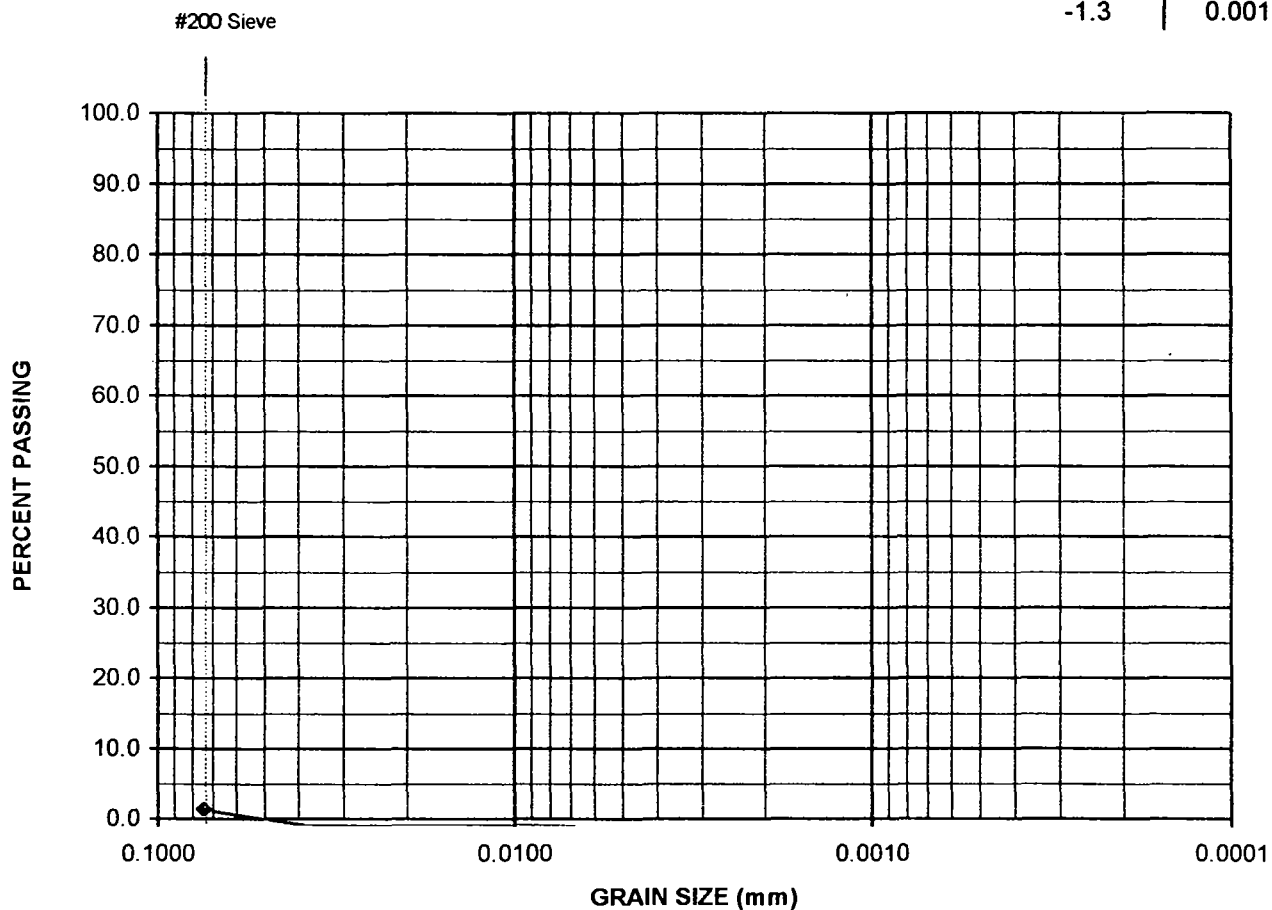
99-0414-11

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 45.5
 Percent passing the No. 200 Sieve: 1.3
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
-1.0	0.0373
-1.0	0.0236
-1.0	0.0136
-1.0	0.0096
-1.0	0.0068
-1.6	0.0034
-1.3	0.0014
-1.3	0.0014
-1.3	0.0014
-1.3	0.0014



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Project

688-9T192

Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

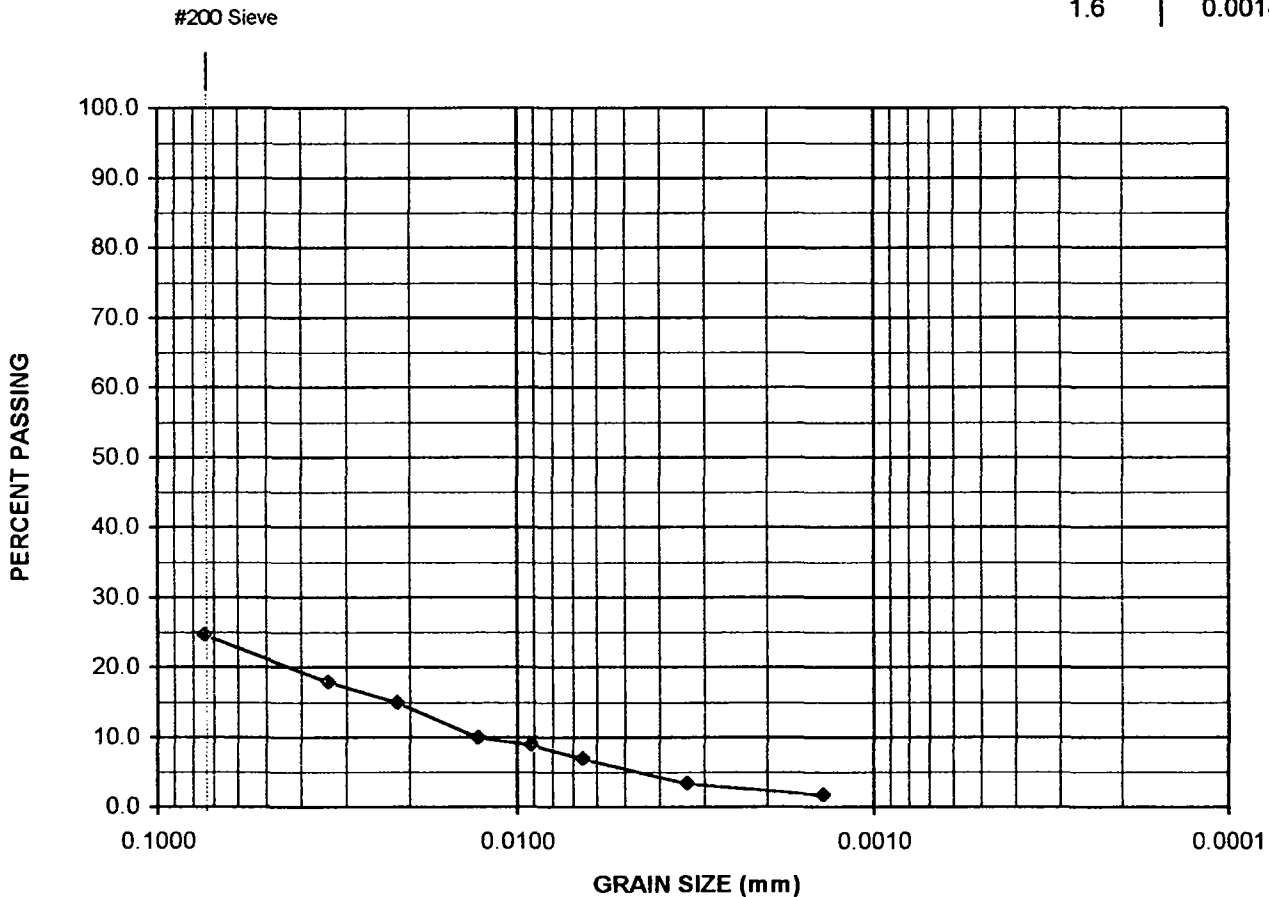
Sample Identification:

99-0414-12

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 96.7
Percent passing the No. 200 Sieve: 24.6
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
17.9	0.0334
14.9	0.0215
9.9	0.0128
8.9	0.0091
6.9	0.0065
3.3	0.0033
1.6	0.0014
1.6	0.0014
1.6	0.0014
1.6	0.0014



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Job No.

Date 11.5.99

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Sample Identification:

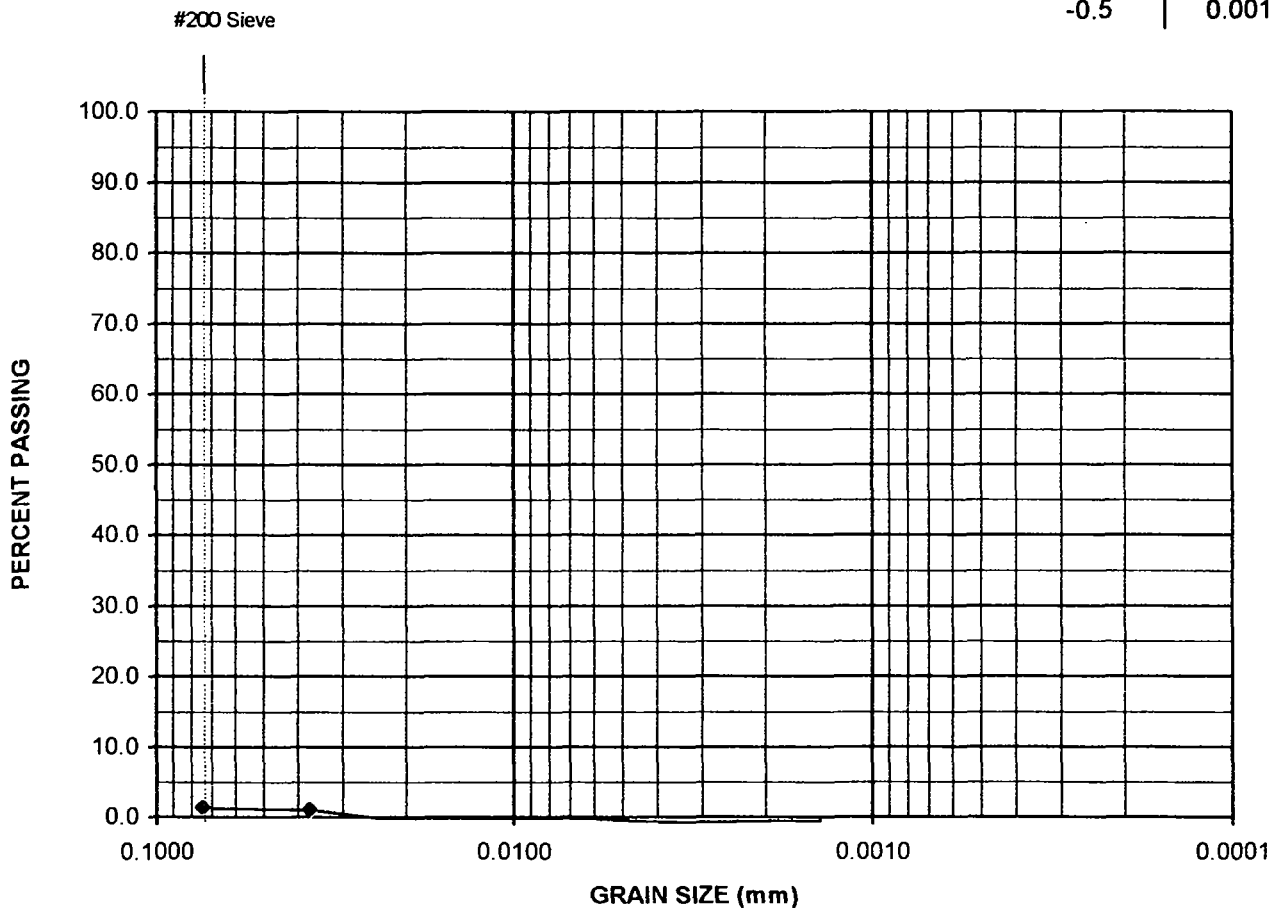
99-0414-13

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 58.6
 Percent passing the No. 200 Sieve: 1.3
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
1.0	0.0369
-0.2	0.0234
-0.2	0.0135
-0.2	0.0096
-0.2	0.0068
-0.8	0.0034
-0.5	0.0014
-0.5	0.0014
-0.5	0.0014
-0.5	0.0014



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Date

11.5.99

HYDROMETER ANALYSIS REPORT

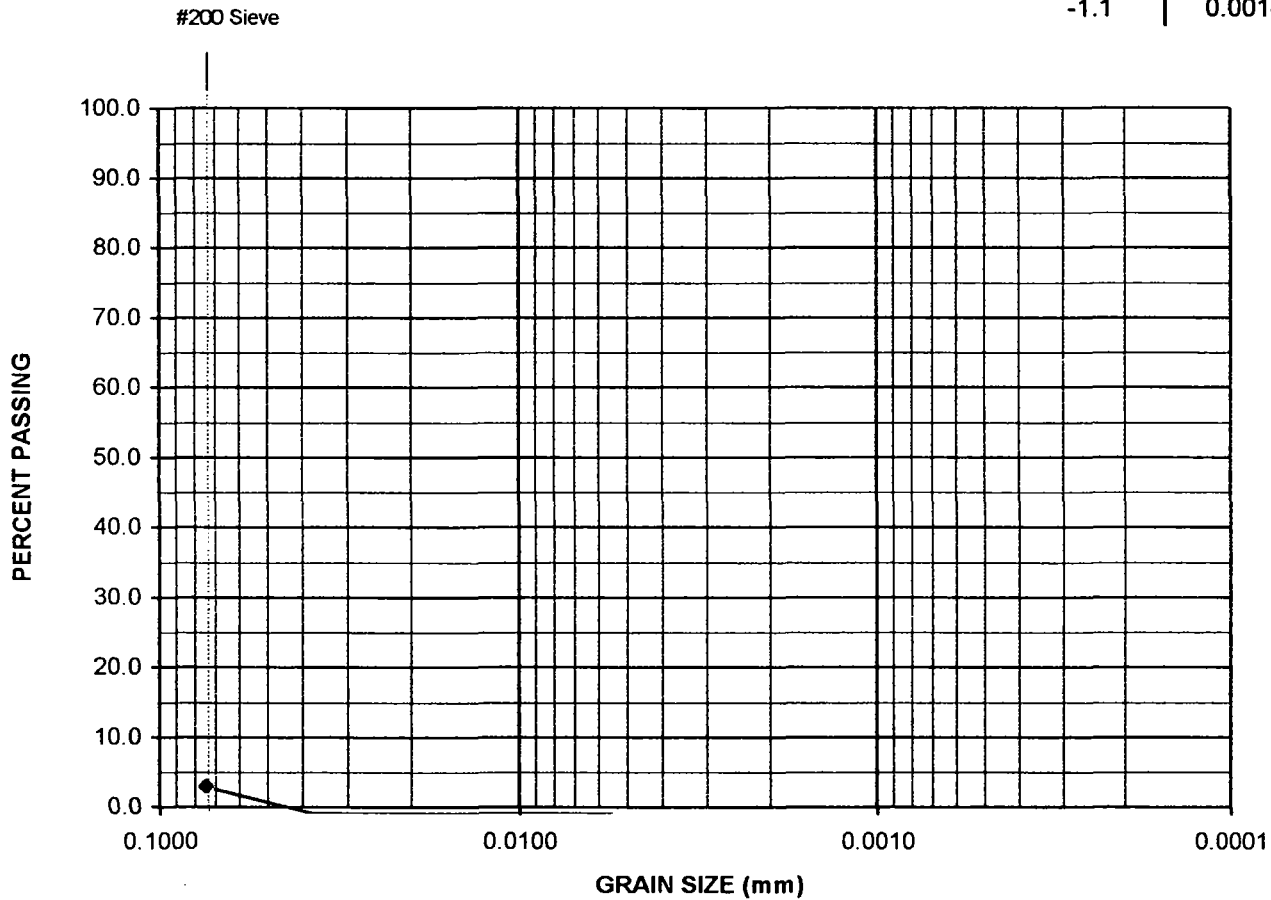
Sample Identification:

99-0414-14

Sample Description:

Soil sample

		%FINER	D(mm)
Percent passing the No. 10 Sieve:	41.0	-0.9	0.0373
		-0.9	0.0236
Percent passing the No. 200 Sieve:	2.9	-0.9	0.0136
		-0.9	0.0096
Specific gravity of sample:	2.70 (assumed)	-0.9	0.0068
		-1.4	0.0034
		-1.1	0.0014
		-1.1	0.0014
		-1.1	0.0014
		-1.1	0.0014



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688-9T192

Job No.

Date

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HYDROMETER ANALYSIS REPORT

Sample Identification:

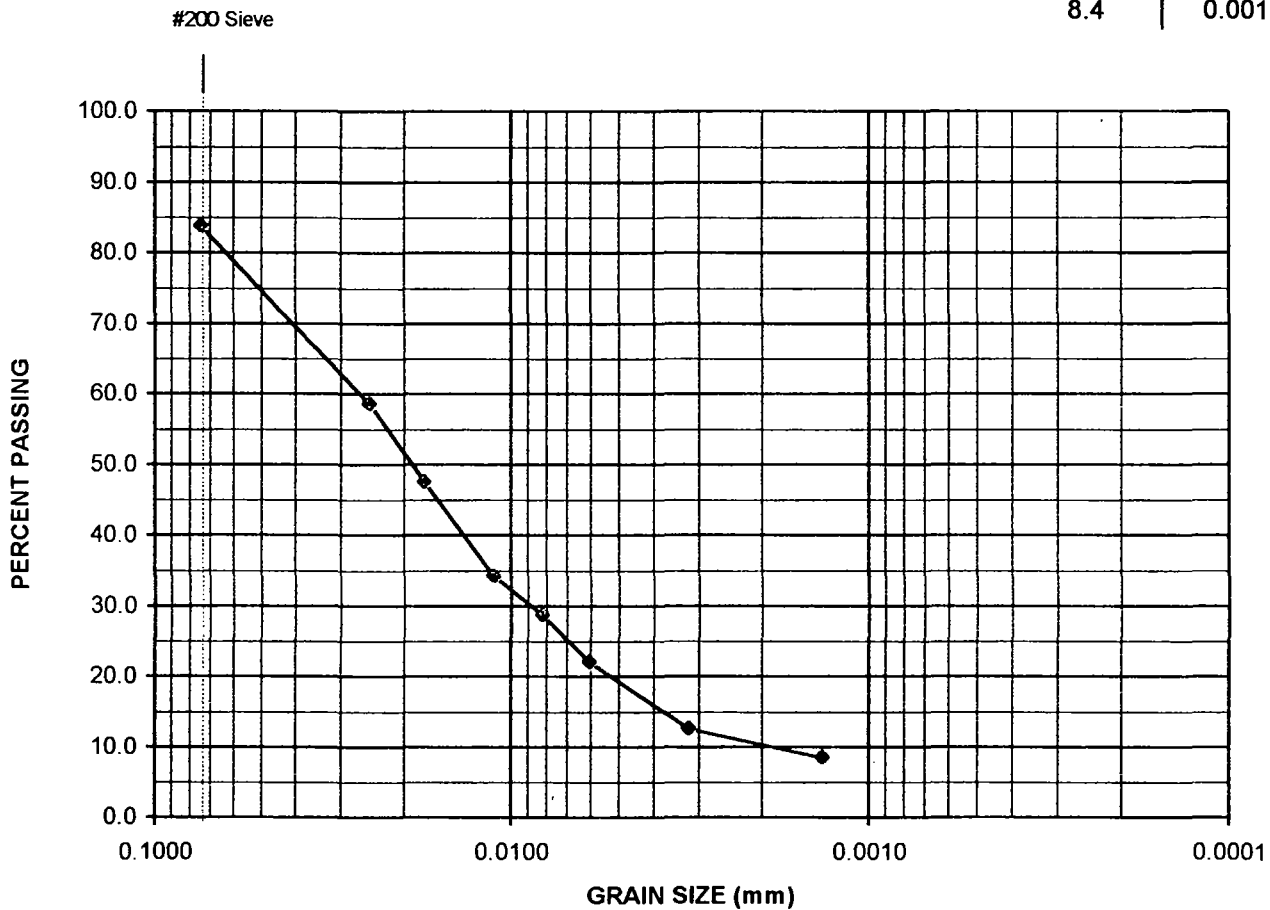
99-0414-15

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.5
 Percent passing the No. 200 Sieve: 83.7
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
58.5	0.0248
47.5	0.0174
34.2	0.0111
28.6	0.0082
22.0	0.0060
12.5	0.0032
8.4	0.0013
8.4	0.0013
8.4	0.0013
8.4	0.0013



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-16

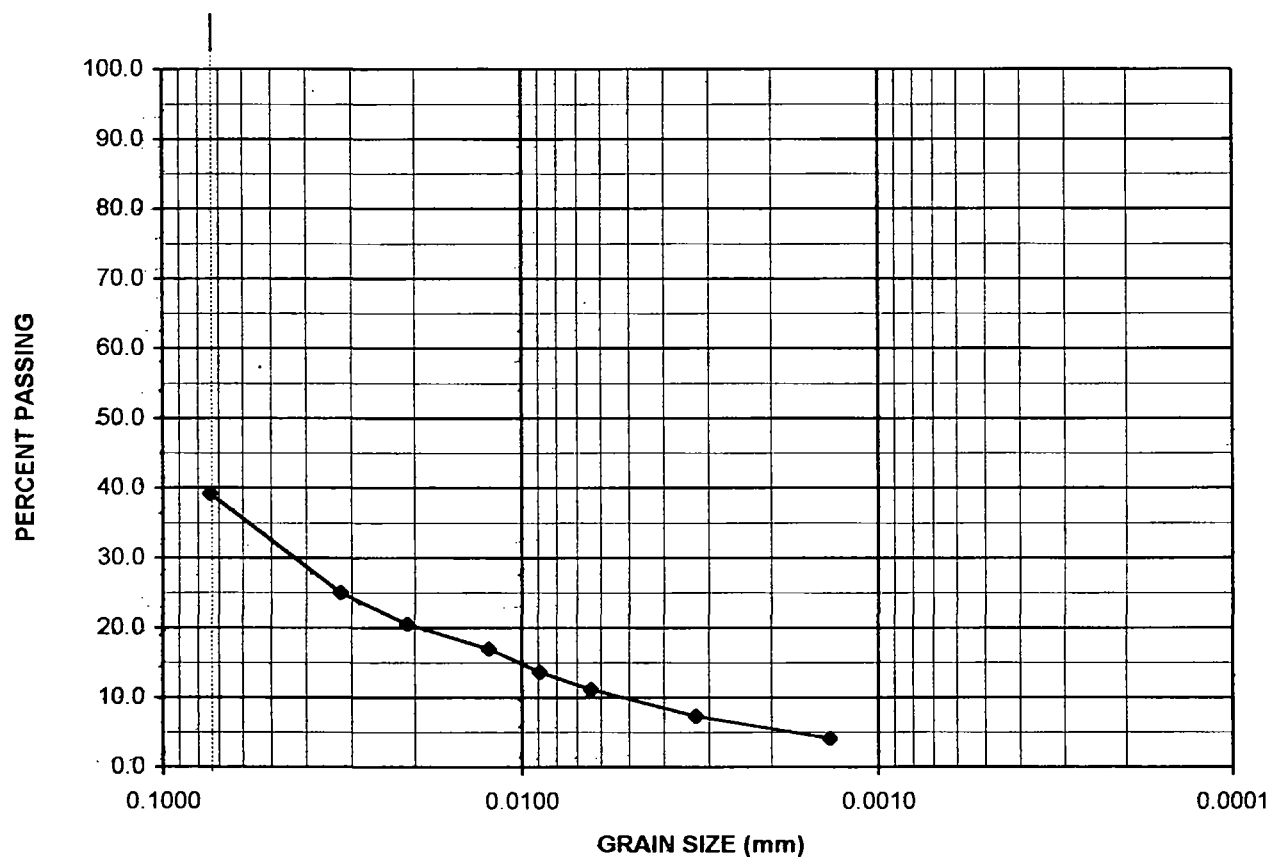
Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.7
 Percent passing the No. 200 Sieve: 39.2
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
25.0	0.0321
20.5	0.0209
17.0	0.0124
13.6	0.0089
11.2	0.0064
7.3	0.0033
4.1	0.0014
4.1	0.0014
4.1	0.0014
4.1	0.0014

#200 Sieve



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Date 11.22.99

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Sample Identification:

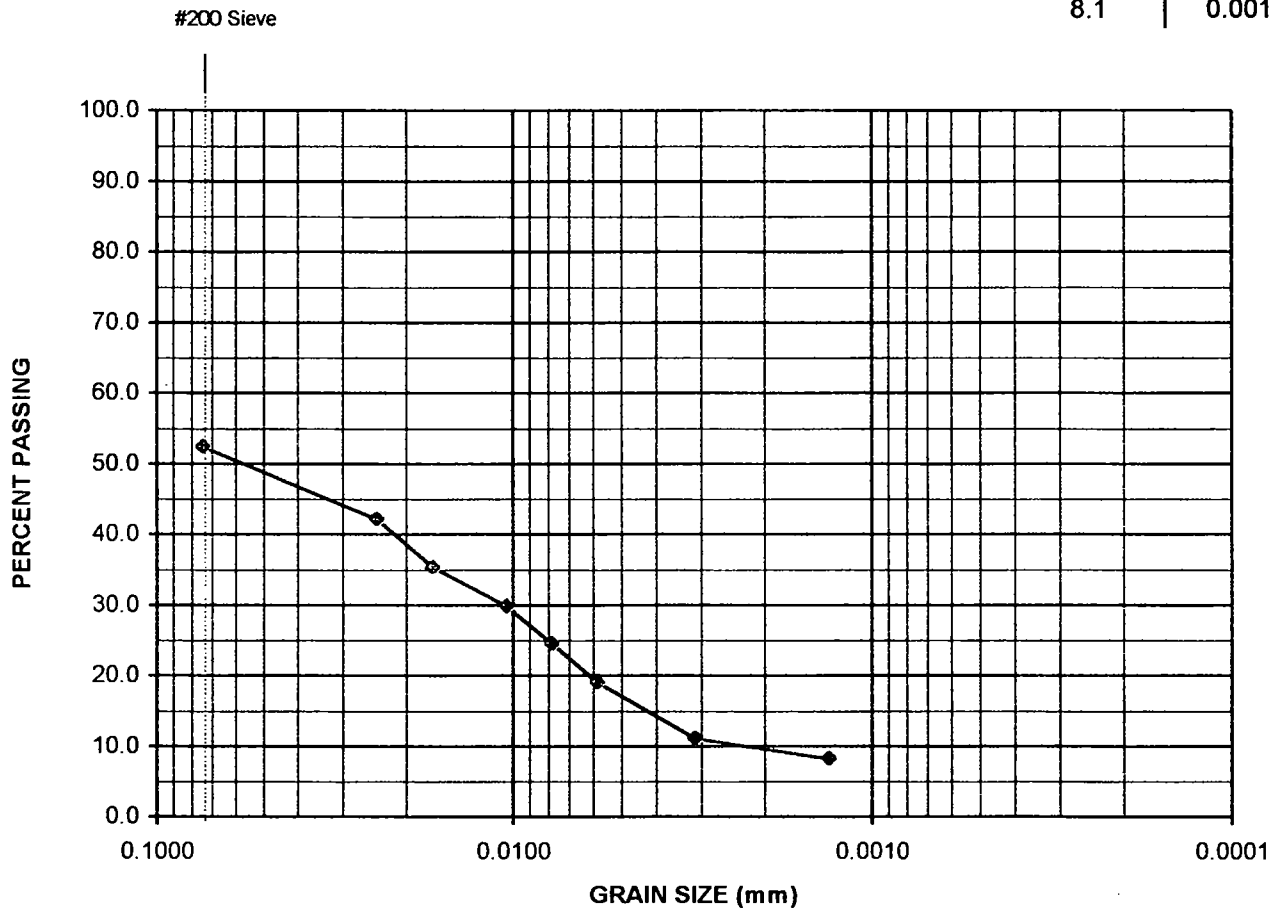
99-0414-17

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 72.7
Percent passing the No. 200 Sieve: 52.3
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
42.1	0.0239
35.3	0.0167
29.8	0.0104
24.5	0.0078
19.0	0.0058
11.1	0.0031
8.1	0.0013
8.1	0.0013
8.1	0.0013
8.1	0.0013



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Job No.

Date

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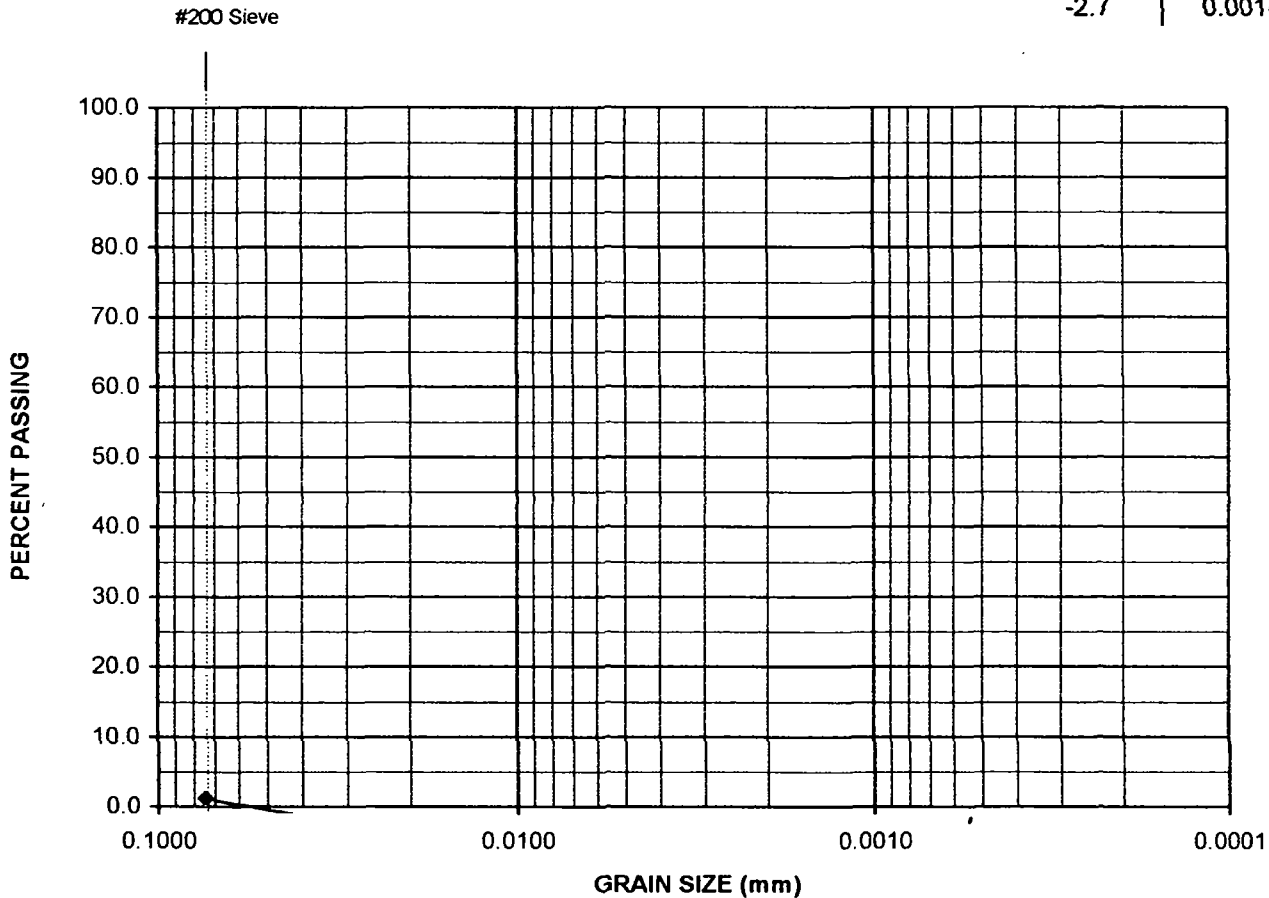
Sample Identification:

99-0414-18

Sample Description:

Soil sample

		%FINER	D(mm)
		-1.7	0.0368
		-1.7	0.0233
Percent passing the No. 10 Sieve:	97.1	-2.0	0.0135
		-2.0	0.0096
Percent passing the No. 200 Sieve:	1.1	-2.2	0.0068
		-3.0	0.0034
Specific gravity of sample:	2.70 (assumed)	-2.7	0.0014
		-2.7	0.0014
		-2.7	0.0014
		-2.7	0.0014



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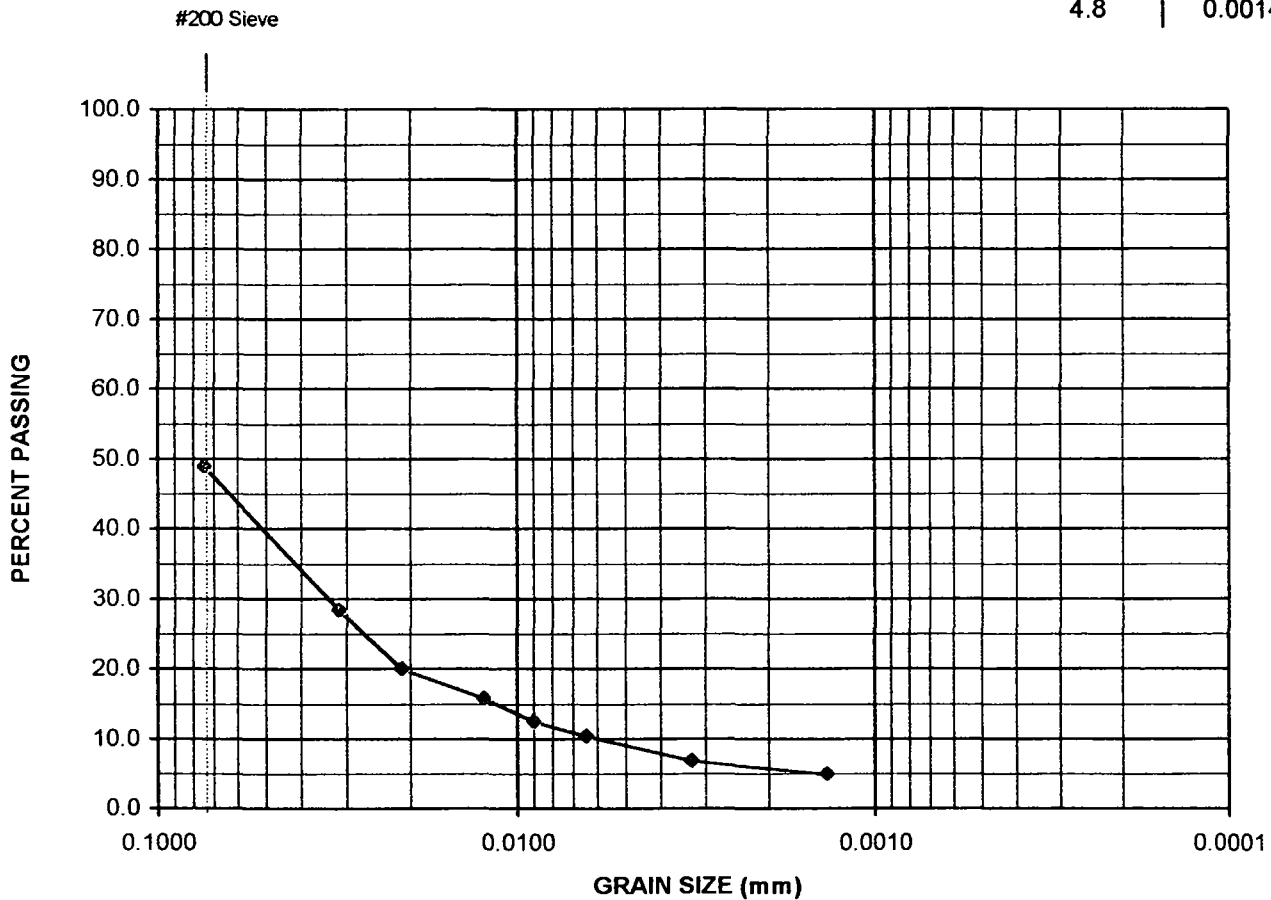
HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-20

Sample Description: Soil sample

		%FINER	D(mm)
		28.3	0.0312
		19.9	0.0209
Percent passing the No. 10 Sieve:	93.3	15.7	0.0124
		12.4	0.0090
Percent passing the No. 200 Sieve:	48.7	10.3	0.0064
		6.8	0.0033
Specific gravity of sample:	2.70 (assumed)	4.8	0.0014
		4.8	0.0014
		4.8	0.0014
		4.8	0.0014



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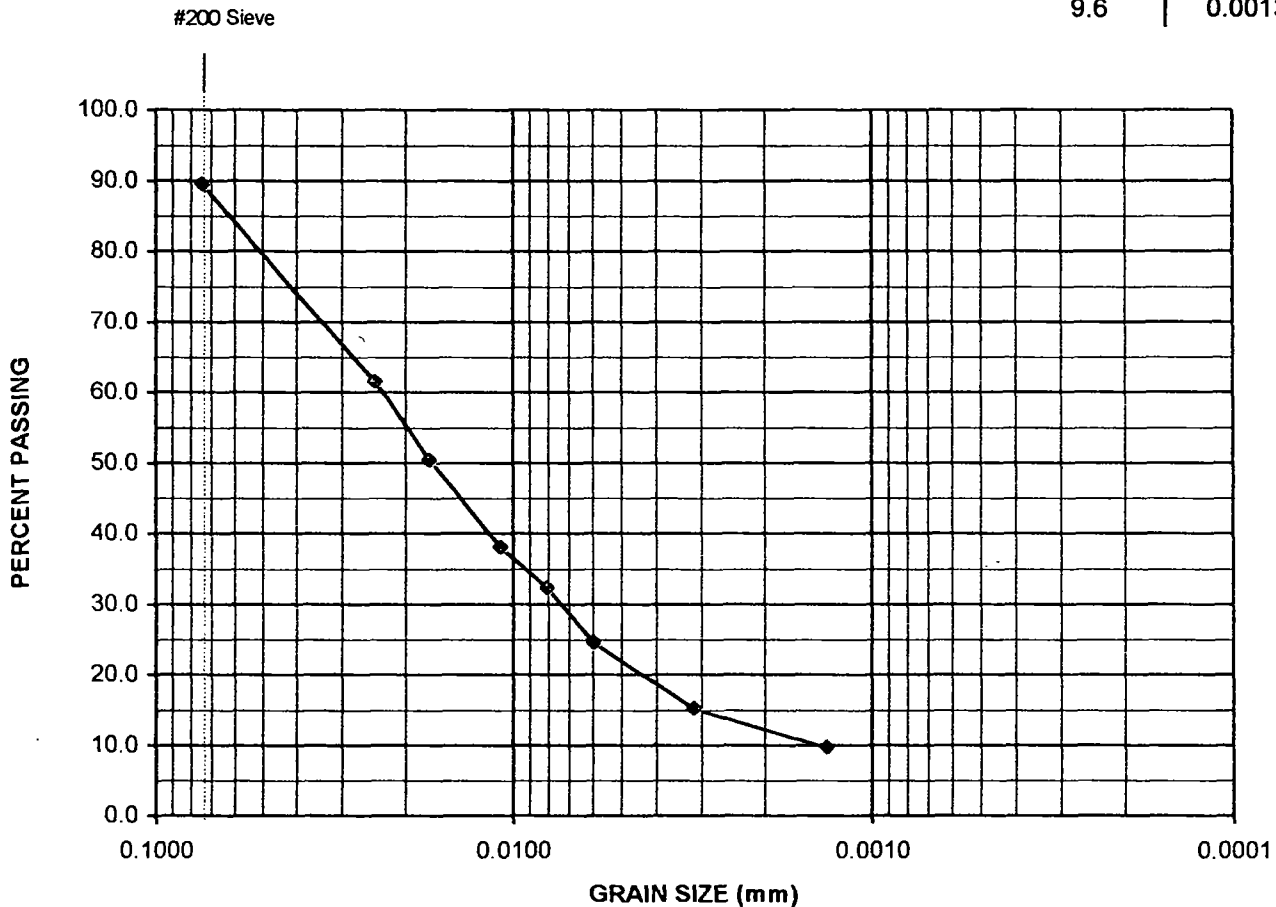
Sample Identification:

99-0414-21

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 98.9
Percent passing the No. 200 Sieve: 89.4
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
61.5	0.0241
50.3	0.0170
38.0	0.0108
32.3	0.0080
24.4	0.0059
15.1	0.0031
9.6	0.0013
9.6	0.0013
9.6	0.0013
9.6	0.0013



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-22

Sample Description:

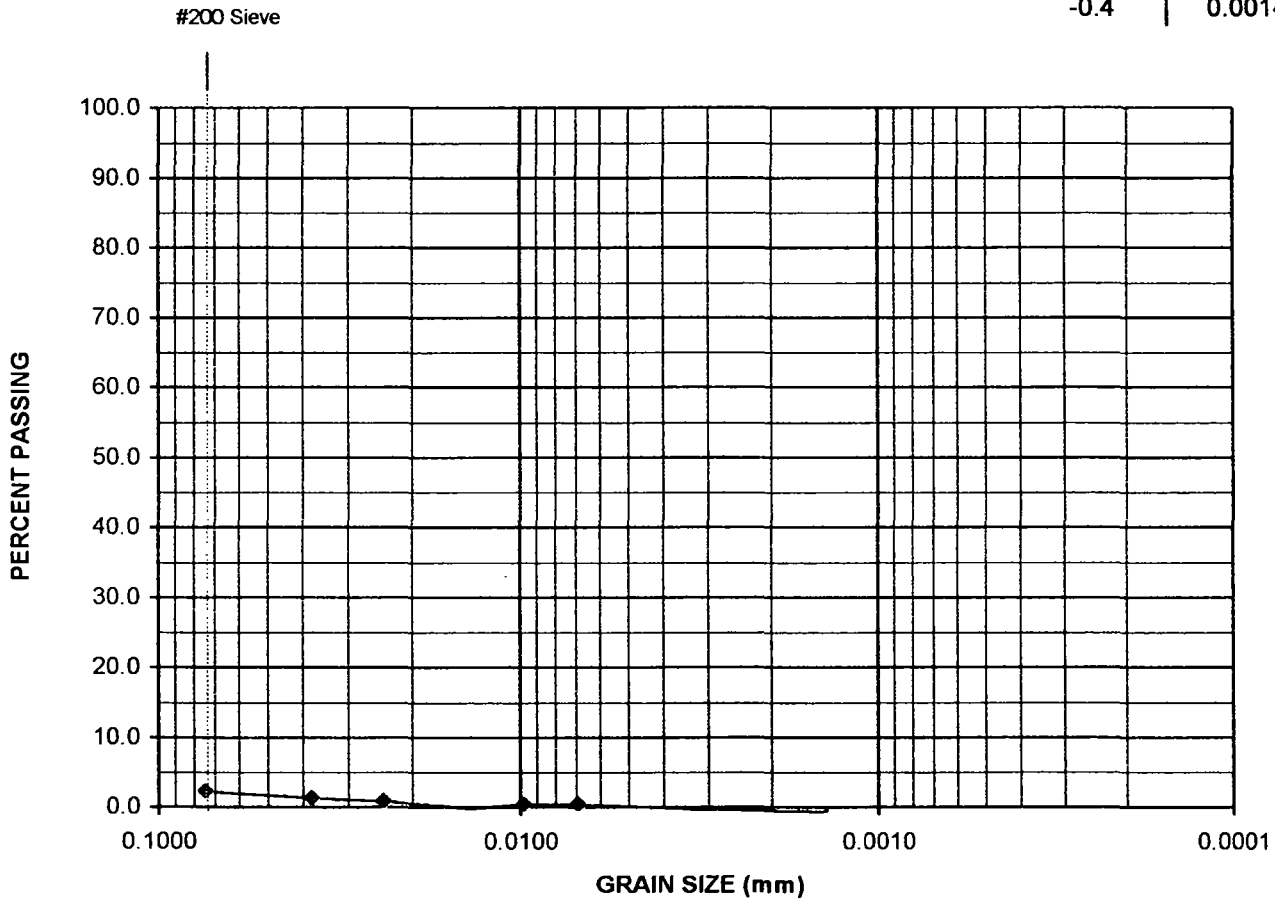
Soil sample

Percent passing the No. 10 Sieve: 99.3

Percent passing the No. 200 Sieve: 2.2

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
1.3	0.0376
0.8	0.0238
-0.2	0.0138
0.3	0.0098
0.3	0.0069
-0.3	0.0033
-0.7	0.0014
-0.4	0.0014
-0.4	0.0014
-0.4	0.0014



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-23

Sample Description:

Soil sample

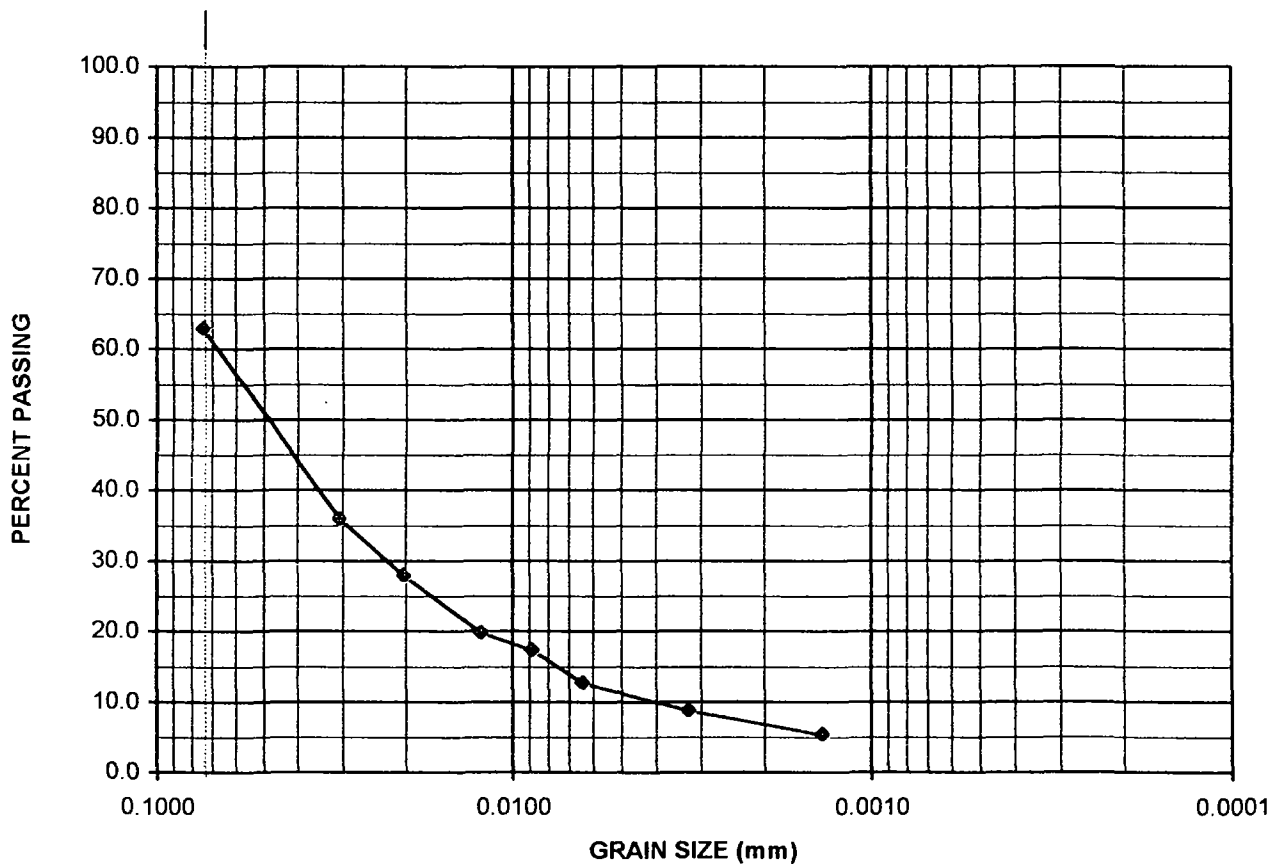
Percent passing the No. 10 Sieve: 98.7

Percent passing the No. 200 Sieve: 62.9

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
35.9	0.0303
27.8	0.0202
19.7	0.0122
17.2	0.0088
12.6	0.0064
8.7	0.0032
5.3	0.0014
5.3	0.0014
5.3	0.0014
5.3	0.0014

#200 Sieve



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Project	688-9T192
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Job No.

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Sample Identification:

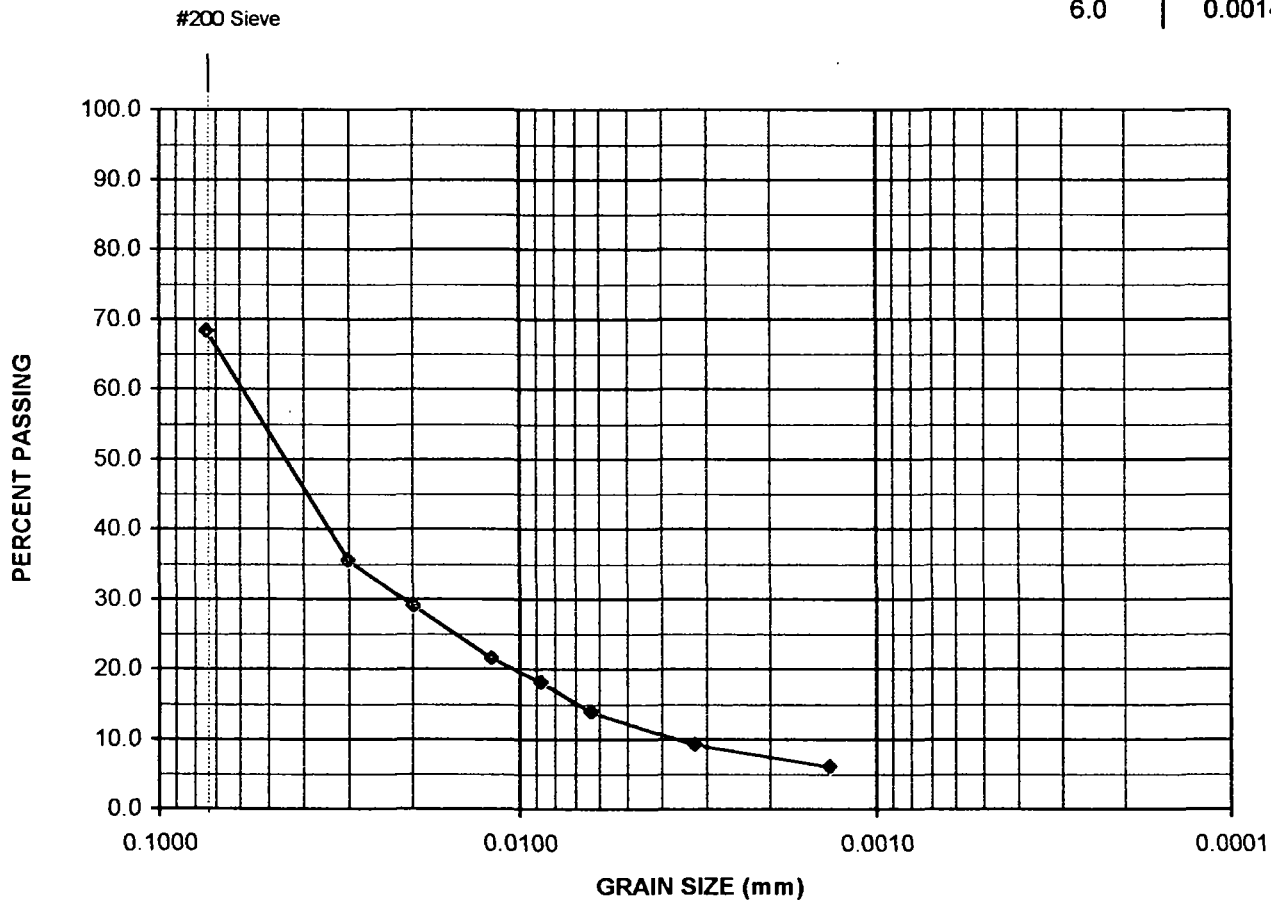
99-0414-24

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9
Percent passing the No. 200 Sieve: 68.2
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
35.4	0.0298
29.0	0.0197
21.5	0.0120
18.1	0.0087
13.8	0.0063
9.1	0.0032
6.0	0.0014
6.0	0.0014
6.0	0.0014
6.0	0.0014



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Date

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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-25

Sample Description:	Soil sample
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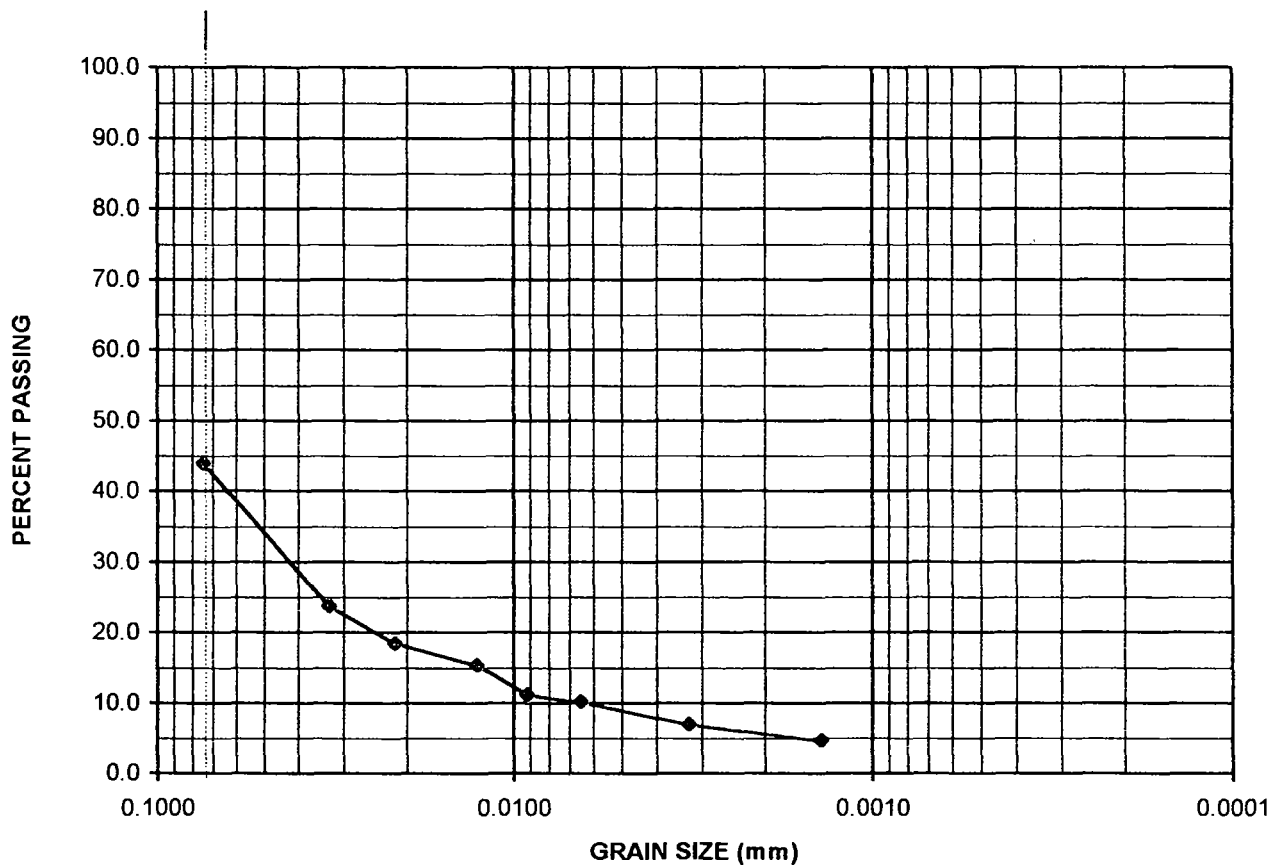
Percent passing the No. 10 Sieve: 98.9

Percent passing the No. 200 Sieve: 43.8

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
23.6	0.0327
18.4	0.0214
15.3	0.0126
11.1	0.0091
10.0	0.0065
6.9	0.0032
4.5	0.0014
4.5	0.0014
4.5	0.0014
4.5	0.0014

#200 Sieve



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Date 11.5.99

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Sample Identification:

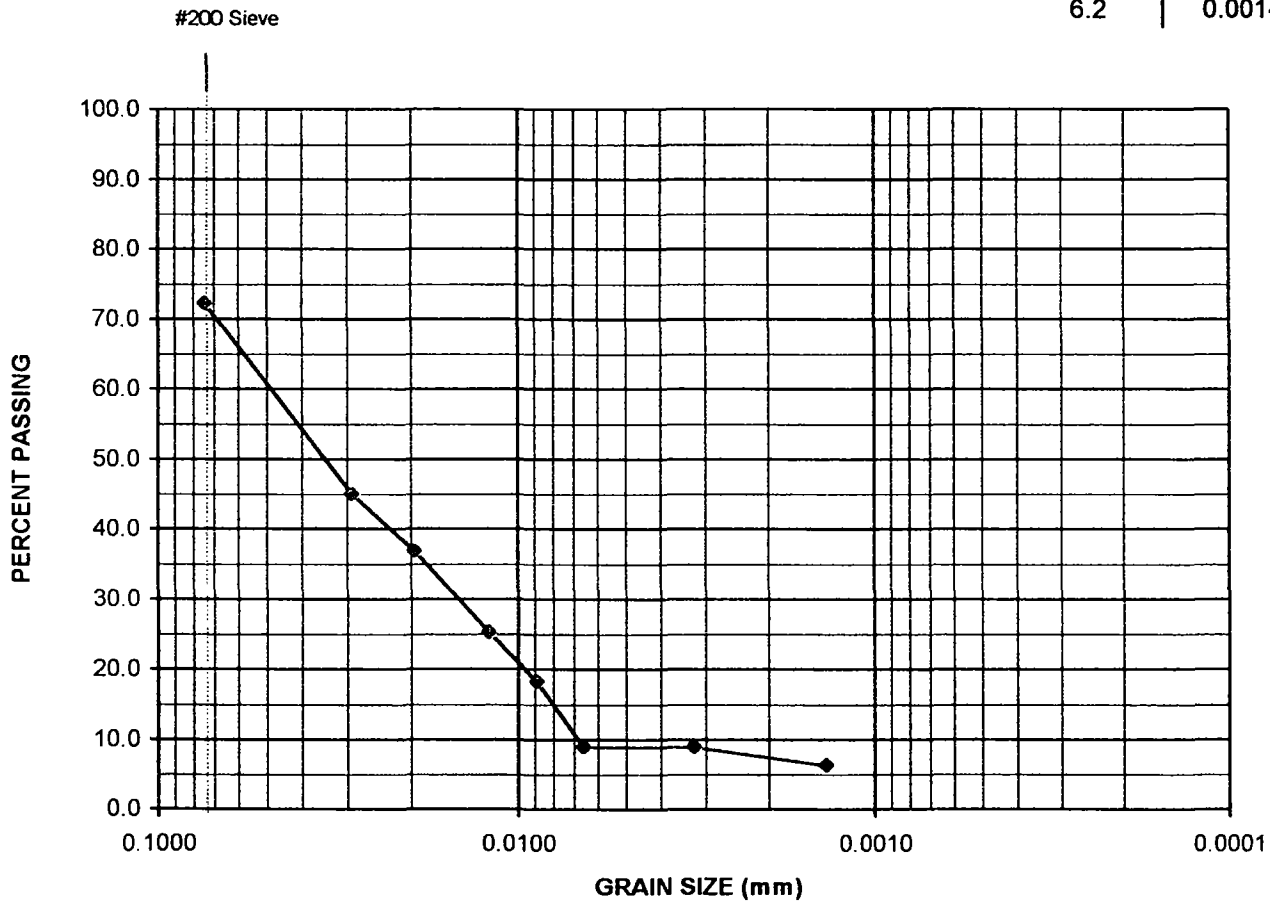
99-0414-26

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.5
Percent passing the No. 200 Sieve: 72.2
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
45.0	0.0289
36.8	0.0194
25.2	0.0120
18.2	0.0088
8.9	0.0066
8.9	0.0032
6.2	0.0014
6.2	0.0014
6.2	0.0014
6.2	0.0014



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Date

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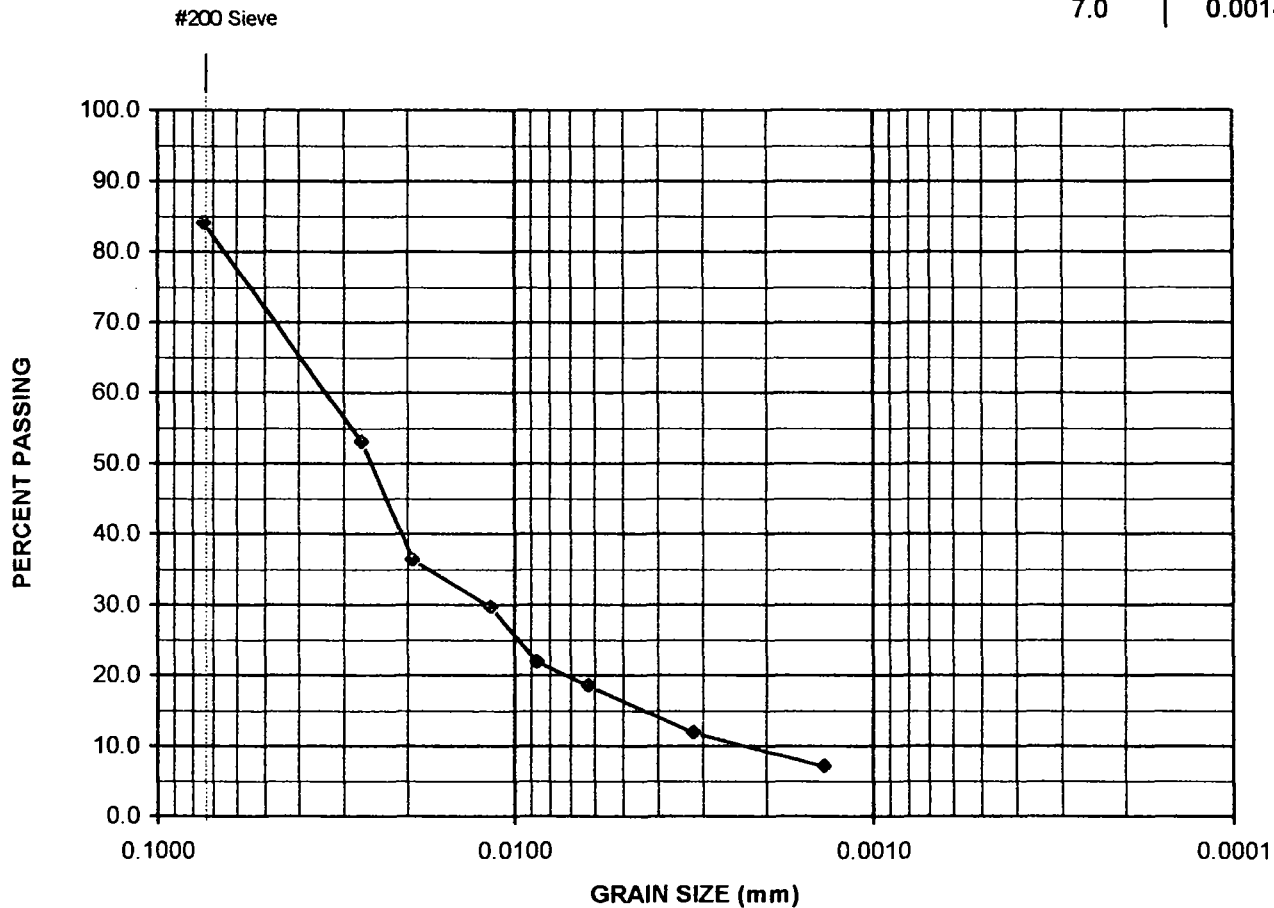
Sample Identification:

99-0414-27

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.9
Percent passing the No. 200 Sieve: 84.1
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
53.0	0.0265
36.3	0.0192
29.6	0.0116
21.8	0.0086
18.5	0.0062
11.8	0.0032
7.0	0.0014
7.0	0.0014
7.0	0.0014
7.0	0.0014



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HYDROMETER ANALYSIS REPORT

Sample Identification:

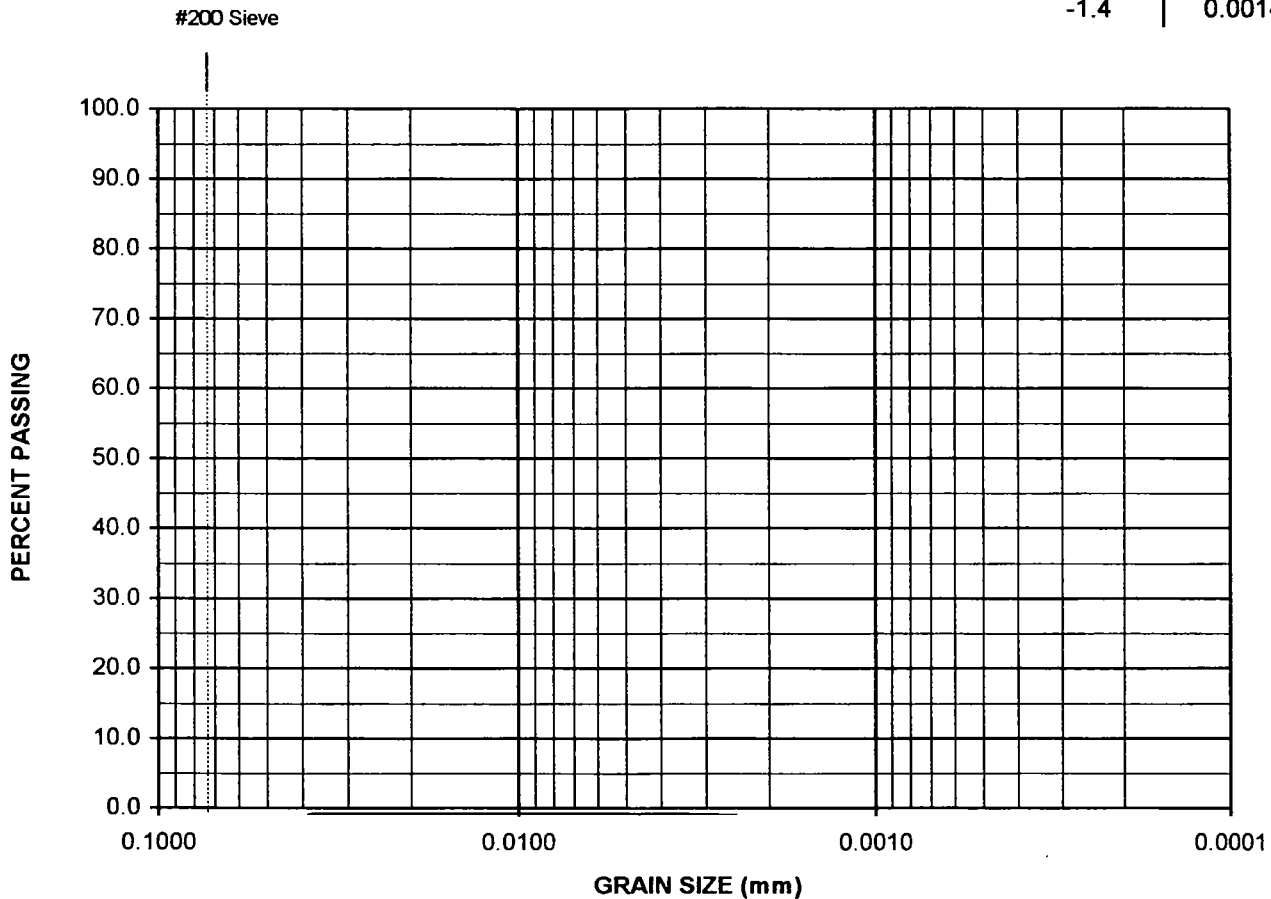
99-0414-28

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 97.2
 Percent passing the No. 200 Sieve: -5.5
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
-0.8	0.0375
-0.8	0.0237
-0.8	0.0137
-0.8	0.0097
-0.8	0.0069
-0.8	0.0034
-1.4	0.0014
-1.4	0.0014
-1.4	0.0014
-1.4	0.0014



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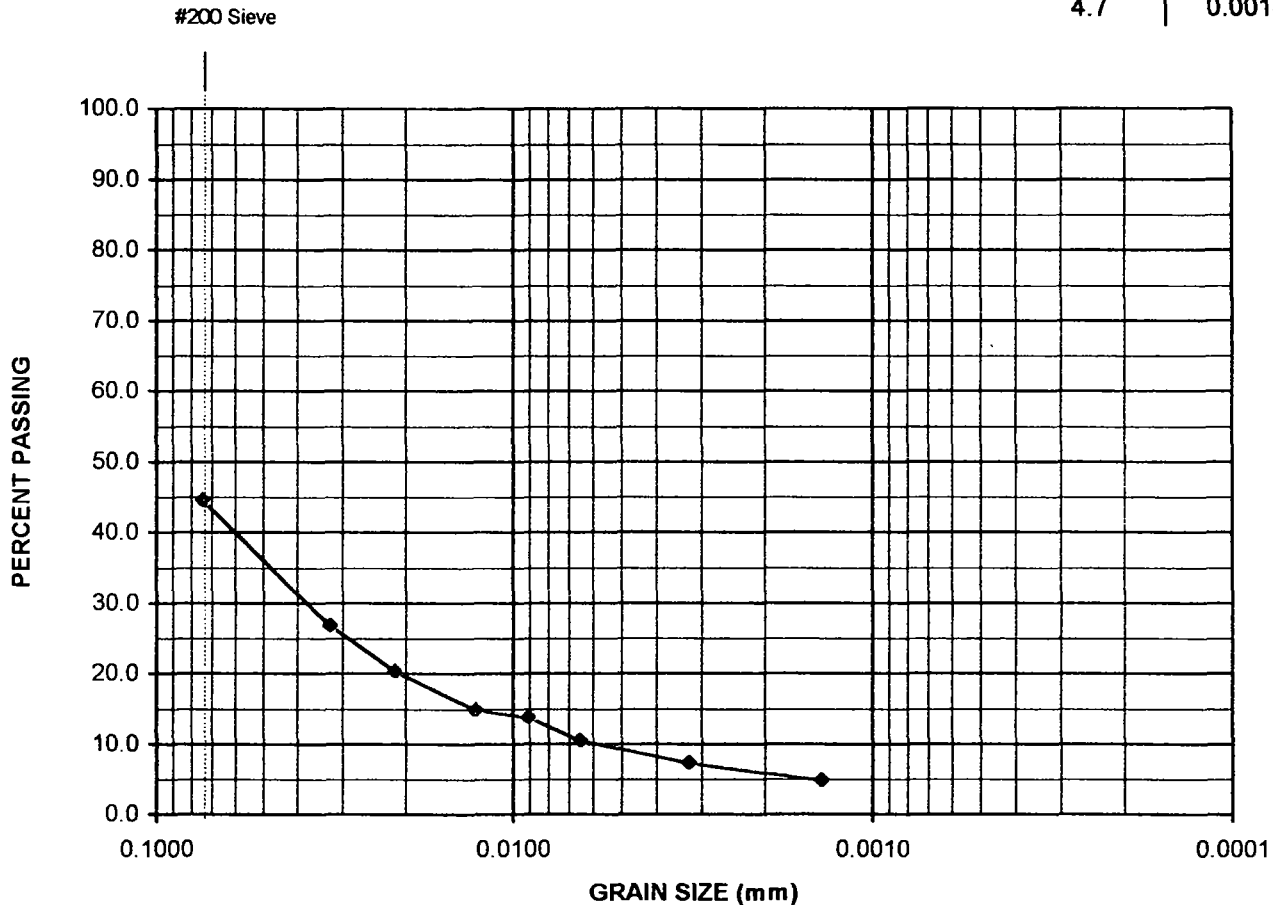
Sample Identification:

99-0414-29

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.4
Percent passing the No. 200 Sieve: 44.5
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
26.8	0.0323
20.2	0.0213
14.8	0.0127
13.7	0.0090
10.4	0.0065
7.2	0.0032
4.7	0.0014
4.7	0.0014
4.7	0.0014
4.7	0.0014



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-30

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9

Percent passing the No. 200 Sieve: 86.4

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
60.5	0.0245
53.9	0.0166
41.7	0.0107
32.8	0.0080
26.2	0.0059
16.2	0.0031
10.3	0.0013
10.3	0.0013
10.3	0.0013
10.3	0.0013



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HYDROMETER ANALYSIS REPORT

Sample Identification:

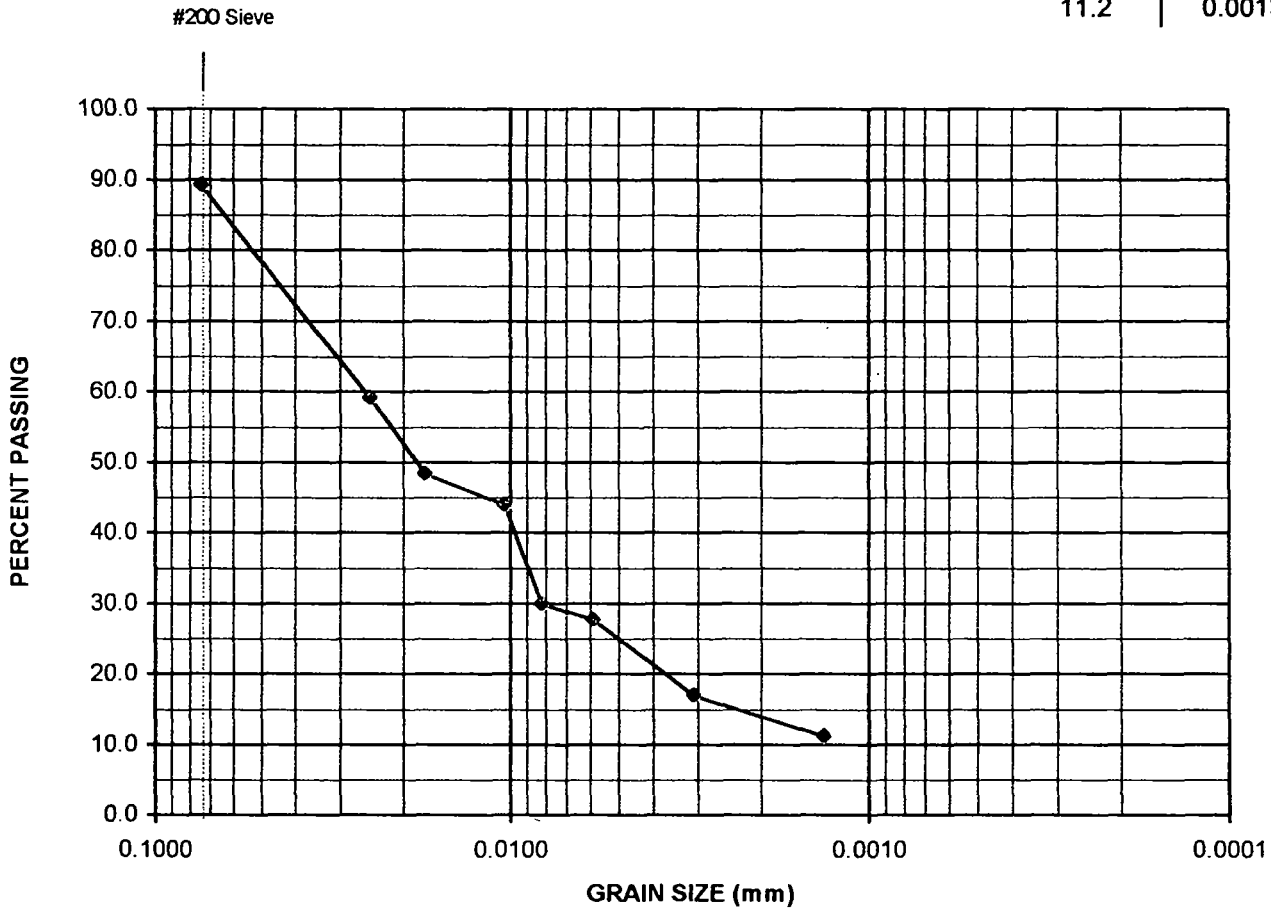
99-0414-31

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 100.0
 Percent passing the No. 200 Sieve: 89.2
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
59.1	0.0245
48.3	0.0173
43.9	0.0104
29.9	0.0082
27.7	0.0059
16.9	0.0031
11.2	0.0013
11.2	0.0013
11.2	0.0013
11.2	0.0013



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Sample Identification:

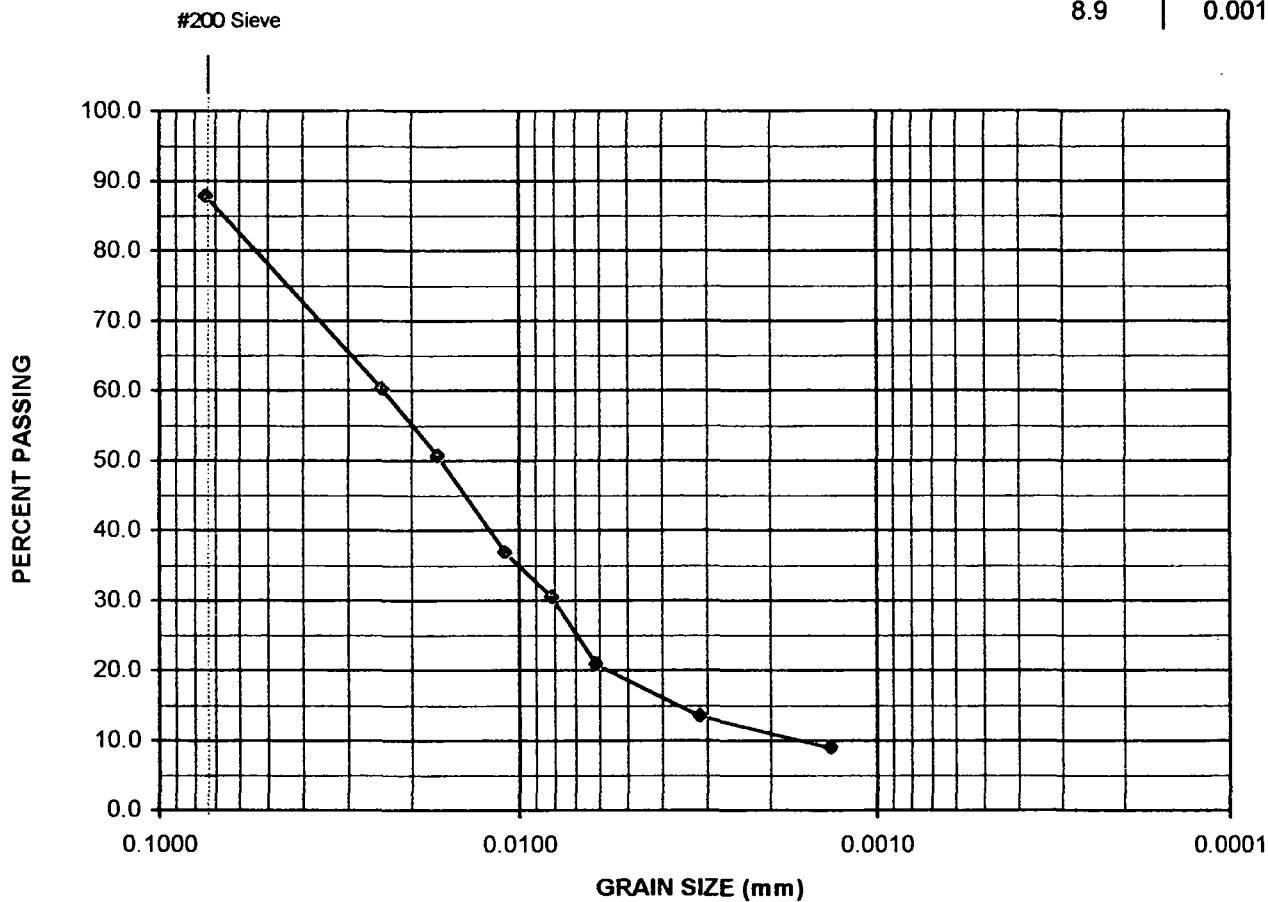
99-0414-32

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9
 Percent passing the No. 200 Sieve: 87.8
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
60.2	0.0239
50.6	0.0168
36.8	0.0109
30.4	0.0081
20.8	0.0061
13.4	0.0031
8.9	0.0013
8.9	0.0013
8.9	0.0013
8.9	0.0013



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Date

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HYDROMETER ANALYSIS REPORT

Sample Identification:

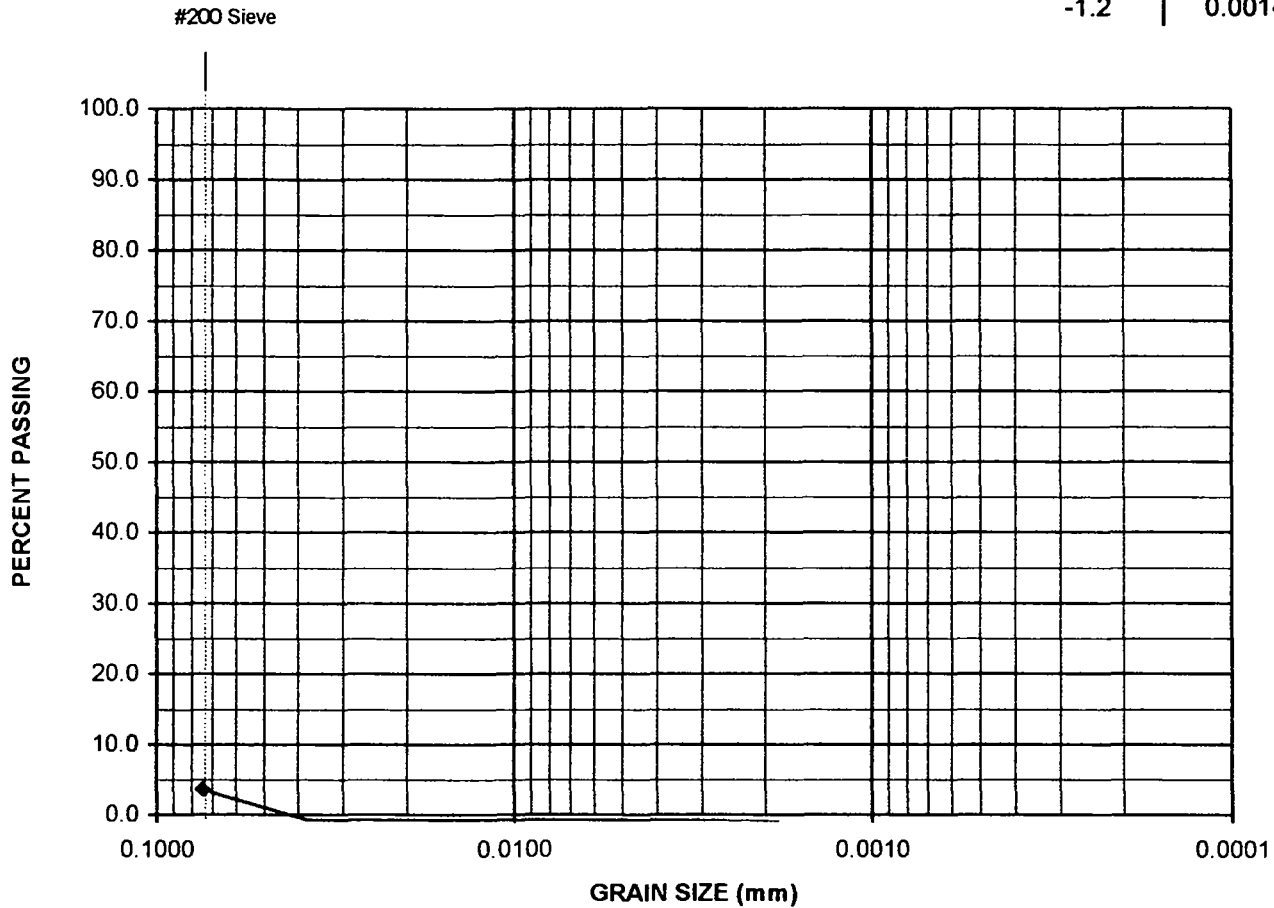
99-0414-33

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 87.8
Percent passing the No. 200 Sieve: 3.4
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
-0.7	0.0375
-0.7	0.0237
-0.7	0.0137
-0.7	0.0097
-0.7	0.0069
-0.7	0.0034
-1.2	0.0014
-1.2	0.0014
-1.2	0.0014
-1.2	0.0014



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-34

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.9
Percent passing the No. 200 Sieve: 90.6
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
63.3	0.0236
57.8	0.0159
40.2	0.0107
32.5	0.0080
24.8	0.0060
13.8	0.0031
9.2	0.0013
9.2	0.0013
9.2	0.0013
9.2	0.0013



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HYDROMETER ANALYSIS REPORT

Sample Identification:

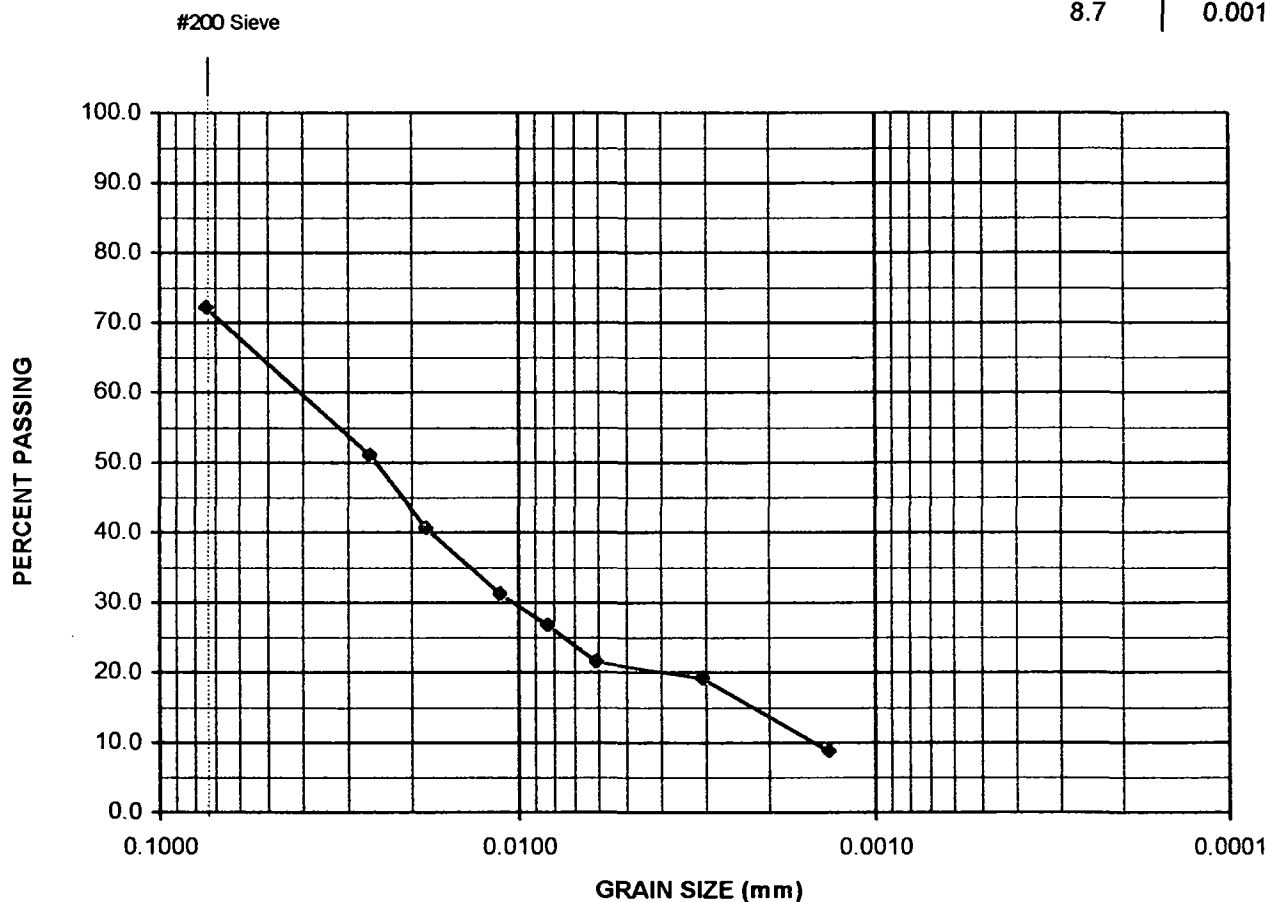
99-0414-36

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.7
Percent passing the No. 200 Sieve: 72.1
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
51.0	0.0259
40.5	0.0181
31.1	0.0112
26.7	0.0083
21.5	0.0061
19.1	0.0030
8.7	0.0013
8.7	0.0013
8.7	0.0013
8.7	0.0013



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Sample Identification:

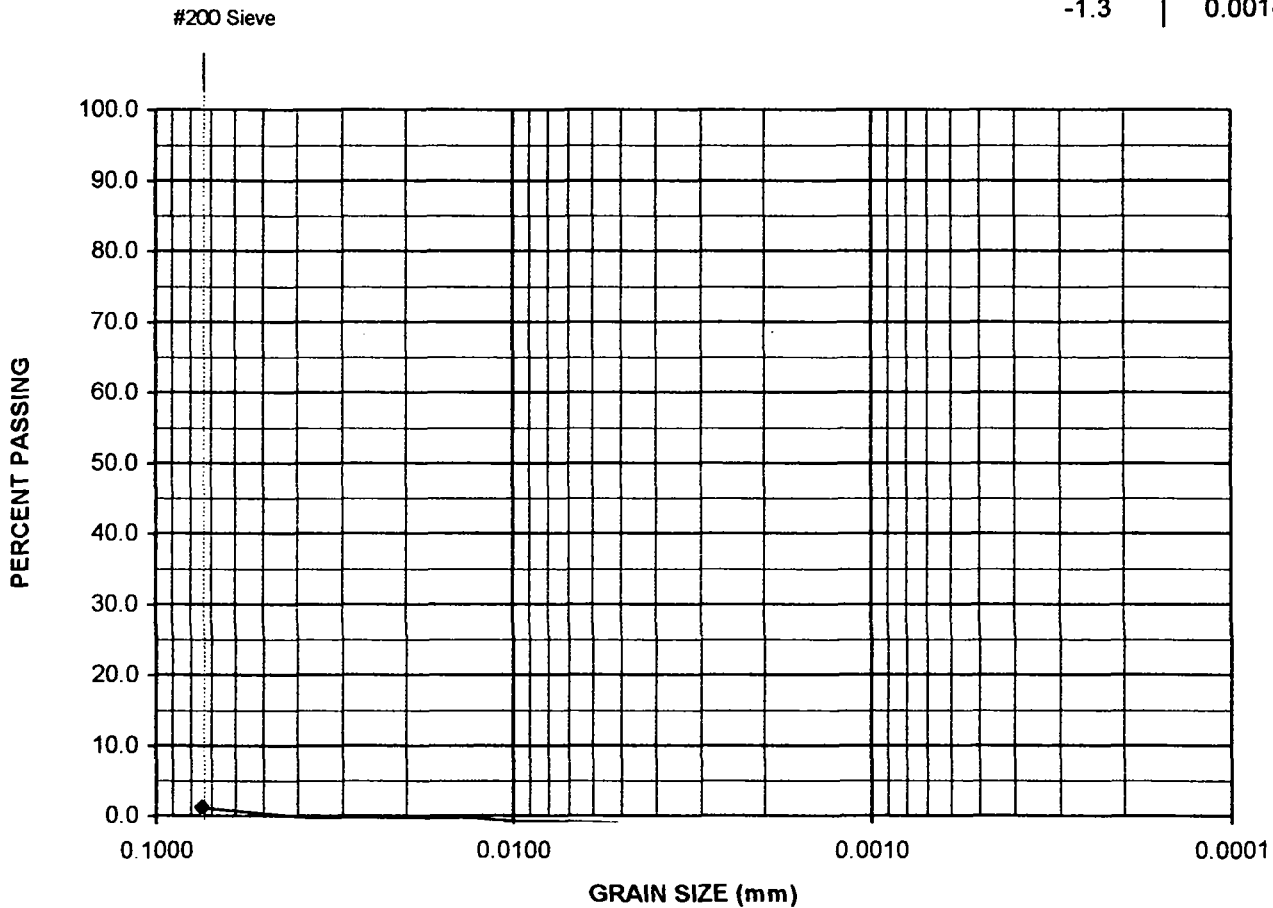
99-0414-37

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9
Percent passing the No. 200 Sieve: 1.1
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
-0.3	0.0371
-0.3	0.0234
-0.3	0.0135
-0.8	0.0097
-0.8	0.0069
-1.3	0.0034
-1.3	0.0014
-1.3	0.0014
-1.3	0.0014
-1.3	0.0014



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HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-38

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.6

Percent passing the No. 200 Sieve: 94.4

Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
60.3	0.0242
58.1	0.0157
44.9	0.0102
34.7	0.0079
28.1	0.0059
16.8	0.0031
10.2	0.0013
10.2	0.0013
10.2	0.0013
10.2	0.0013



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HYDROMETER ANALYSIS REPORT

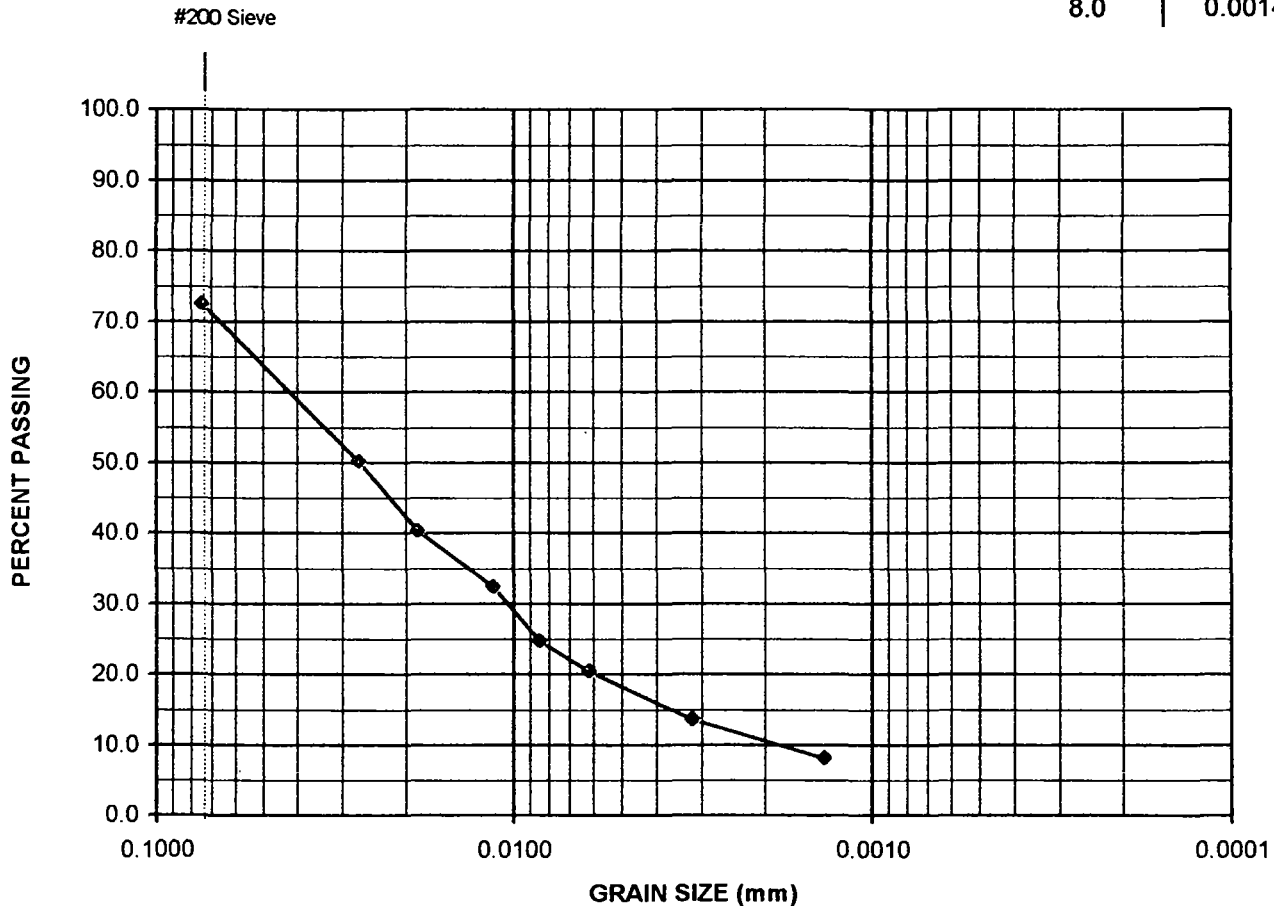
Sample Identification:

99-0414-39

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.6
Percent passing the No. 200 Sieve: 72.4
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
50.1	0.0267
40.3	0.0184
32.4	0.0114
24.7	0.0084
20.3	0.0061
13.5	0.0032
8.0	0.0014
8.0	0.0014
8.0	0.0014
8.0	0.0014



HYDROMETER ANALYSIS REPORT

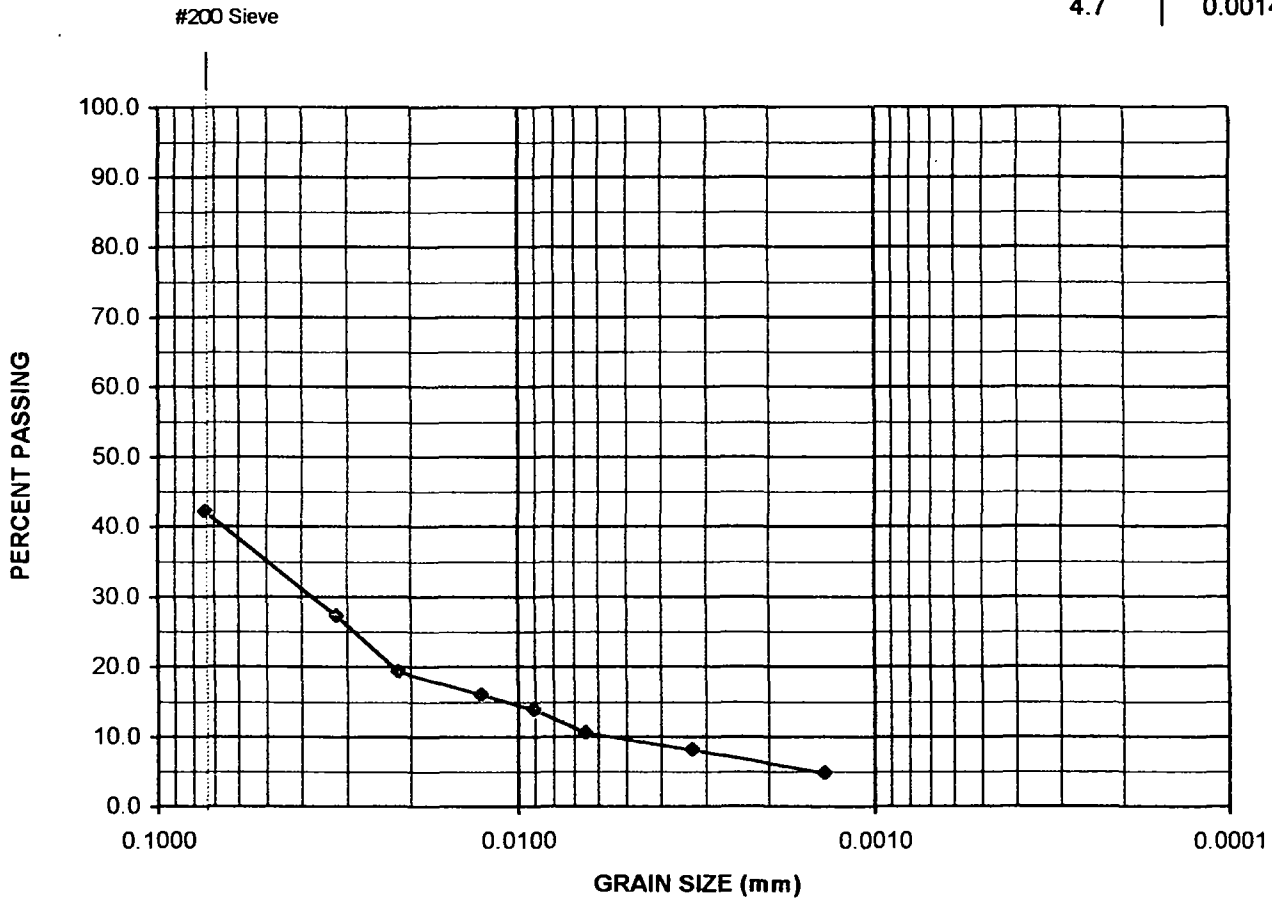
Sample Identification:

99-0414-40

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.8
Percent passing the No. 200 Sieve: 42.1
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
27.2	0.0319
19.3	0.0214
16.0	0.0126
13.8	0.0090
10.5	0.0065
8.0	0.0033
4.7	0.0014
4.7	0.0014
4.7	0.0014
4.7	0.0014



Report No. 99-0414

Reviewed By: _____

Test conducted according to ASTM D422-63



6032 N. Cutter Circle, Suite 480 Portland, Oregon

Client

Oregon Analytical Laboratory

Project

688-9T192

Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

99-0414-41

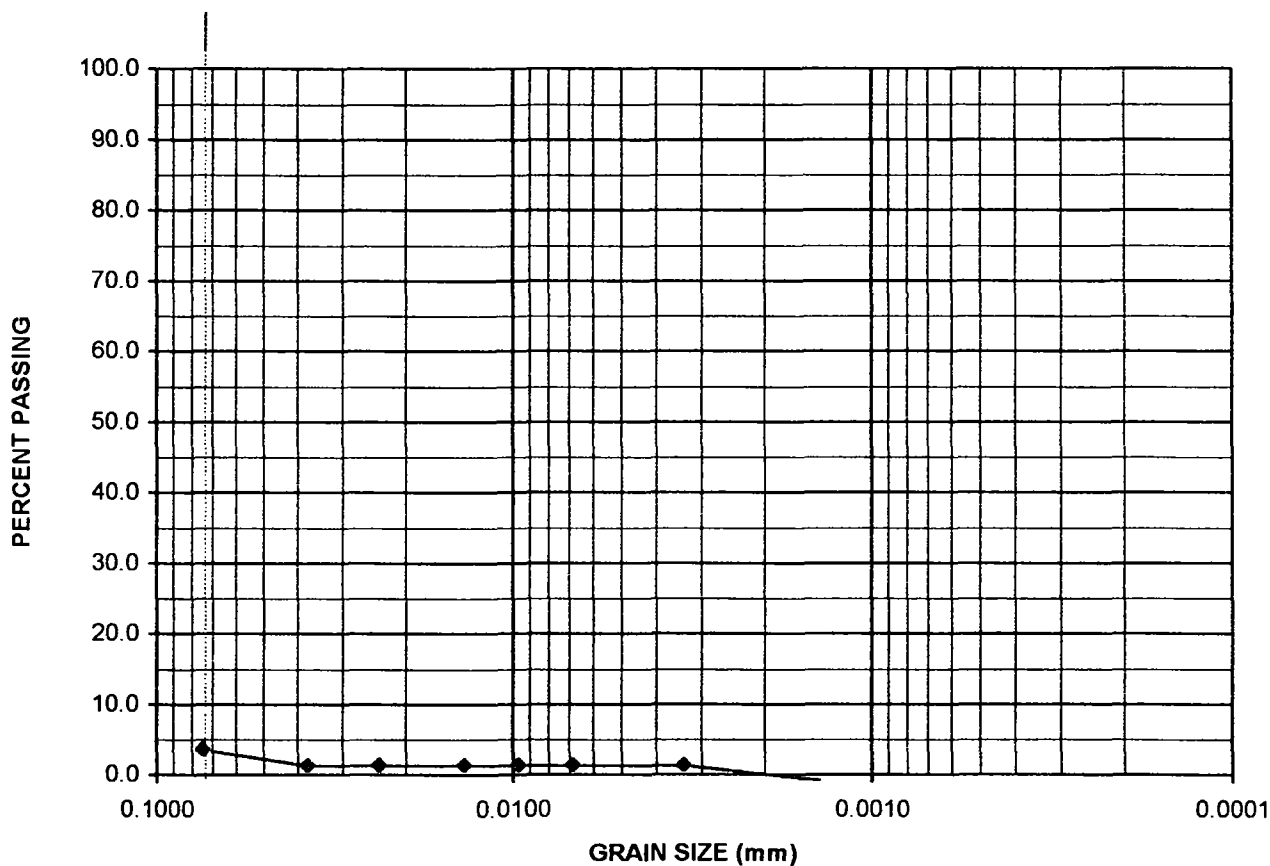
Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.6
 Percent passing the No. 200 Sieve: 3.5
 Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
1.2	0.0373
1.2	0.0236
1.2	0.0136
1.2	0.0096
1.2	0.0068
1.2	0.0033
-0.8	0.0014
-0.8	0.0014
-0.8	0.0014
-0.8	0.0014

#200 Sieve



HYDROMETER ANALYSIS REPORT

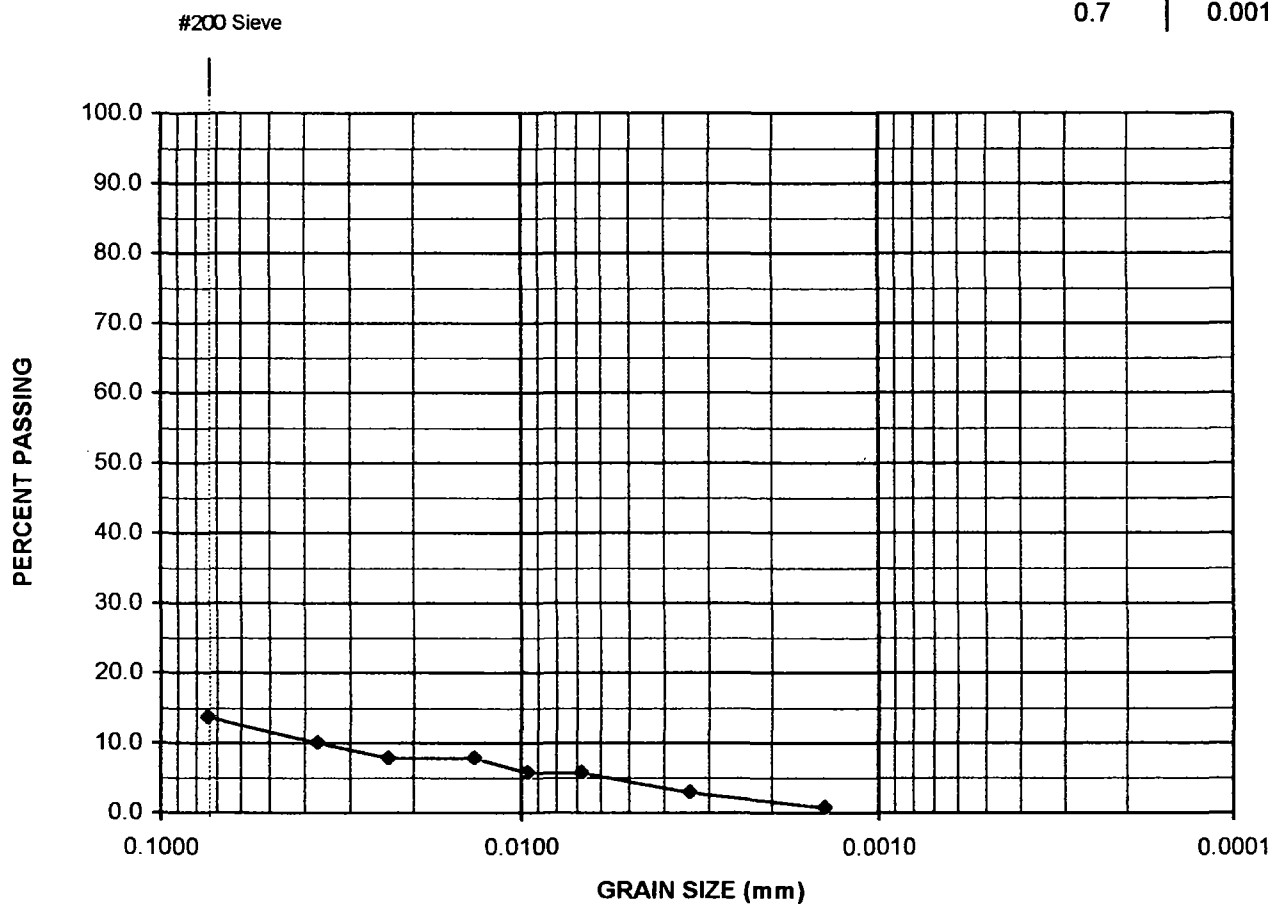
Sample Identification:

99-0414-42

Sample Description: Soil sample

Percent passing the No. 10 Sieve: 99.3
Percent passing the No. 200 Sieve: 13.6
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
9.9	0.0365
7.8	0.0232
7.8	0.0134
5.6	0.0095
5.6	0.0067
2.9	0.0034
0.7	0.0014
0.7	0.0014
0.7	0.0014
0.7	0.0014



Report No. 99-0414

Reviewed By: _____

Test conducted according to ASTM D422-63



6032 N. Cutter Circle, Suite 480 Portland, Oregon

Client

Oregon Analytical Laboratory

Project

688-9T192

Job No.

Date

11.5.99

HYDROMETER ANALYSIS REPORT

Sample Identification:

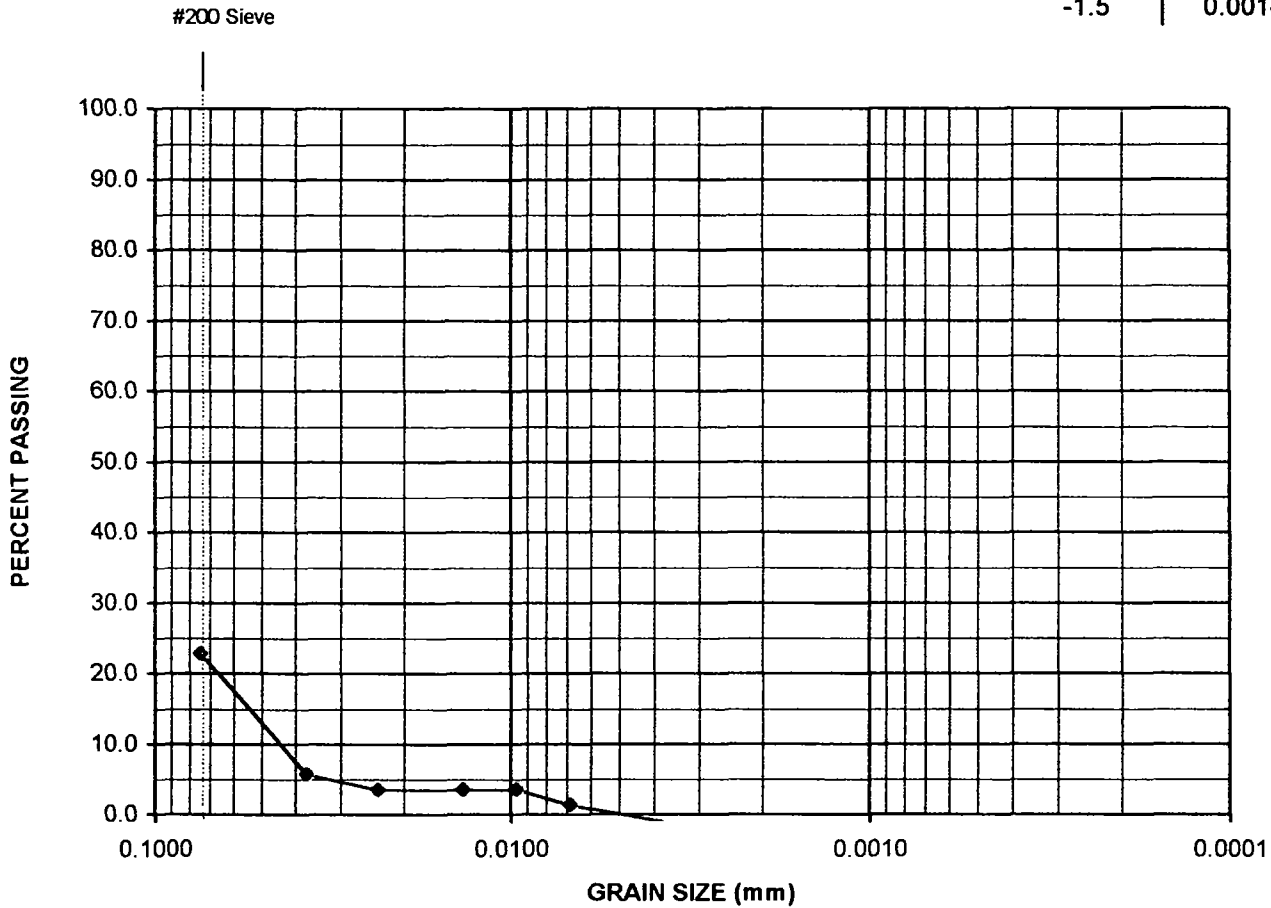
99-0414-43

Sample Description:

Soil sample

Percent passing the No. 10 Sieve: 99.9
Percent passing the No. 200 Sieve: 22.7
Specific gravity of sample: 2.70 (assumed)

%FINER	D(mm)
5.6	0.0369
3.5	0.0235
3.5	0.0136
3.5	0.0096
1.3	0.0068
-1.5	0.0034
-1.5	0.0014
-1.5	0.0014
-1.5	0.0014
-1.5	0.0014



Report No. 99-0414

Reviewed By: _____

Test conducted according to ASTM D422-63.



6032 N. Cutter Circle, Suite 480 Portland, Oregon

Client

Oregon Analytical Laboratory

Project

688-9T192

Job No.

Date

11.5.99

BIOASSAY REPORT
10-DAY FRESHWATER SEDIMENT BIOASSAYS
Conducted October 18 through November 19, 1999

Prepared for

OREGON ANALYTICAL
BEAVERTON, OREGON

Prepared by

CH2M HILL
2300 NW Walnut Boulevard
Corvallis, Oregon 97330

December, 1999
Lab I.D. Nos. C02434-01 through -43

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INTRODUCTION

CH2M HILL conducted 10 day freshwater sediment bioassays from October 18 through November 19, 1999 on samples provided by Oregon Analytical Laboratory, Beaverton, Oregon. The organisms tested were the amphipod (*Hyalella azteca*) and midge (*Chironomid tentans*). The *Hyalella azteca* tests performed from October 18 through 28 failed to meet the minimum test acceptability of 80 percent survival, and the tests on those samples were repeated from November 9 through 19, 1999.

METHODS AND MATERIALS

TEST METHODS

The acute sediment tests were performed according to: ASTM: E 1706-95b *Standard Guide for Conducting Sediment Toxicity Tests with Freshwater Invertebrates*.

TEST ORGANISMS

The amphipods were obtained from Chesapeake Cultures, Naves, Virginia. The amphipod were between the ages of 7-14 days (1.5-2 mm) at the time of test initiation. All test organisms appeared vigorous and in good condition prior to testing.

The chironomids were obtained from Aquatic Bio Systems, Inc., Fort Collins, Colorado. At test initiation the chironomids were third instar (head capsule width between 0.33 to 0.45mm).

DILUTION WATER

The waters used for acclimation and dilution water during the static testing for the amphipods and chironomids were reconstituted moderately hard water with a total hardness of 102, 104, 98, 98 mg/l as CaCO₃; alkalinity of 72, 78, 68, and 72 mg/l as CaCO₃, and pH of 8.3, 7.9, 7.9, 8.0.

SAMPLE PREPARATION

For the *Hyalella azteca* bioassays, 50g of each test sediment sample (100 percent) was placed in a 300 ml high-form beaker, 100 ml of dilution water was then added (Day 0) and allowed to stand overnight. The overlying water was renewed the following morning (Day 1). Test organisms were then added to the beakers.

For the *Chironomid tentans* bioassays, 100g of each test sediment sample (100 percent) was placed in a 300 ml high-form beaker, 175 ml of dilution water was then added (Day 0) and

allowed to stand overnight. The overlying water was renewed the following morning (Day 1). Test organisms were then added to the beakers.

TEST CONCENTRATIONS

The sediment samples were homogenized by hand and any large debris was removed. The concentration tested was 100 percent sample sediment with reference sediment for the control. For both species tested, the concentration (100 percent) was performed in 8 replicates with 10 organisms per replicate. An additional laboratory control using 16 grade washed silica sand was performed on the *Hyalella azteca* test.

The dissolved oxygen levels in the tests remained above 40 percent saturation throughout the test period. Test temperatures remained at $23 \pm 1^\circ\text{C}$. The tests proceeded without interruption or incidents that could have affected test results.

SAMPLE COLLECTION AND DESCRIPTION

The samples were collected between October 12 and 19, 1999 by Ecology and Environment personnel and shipped to CH2M HILL's bioassay laboratory by Oregon Analytical Laboratory personnel. See Chain of Custody Forms in Appendix C. The samples were labeled as follows: MSED99-01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, and L13502-52, 54, 55, and 56.

MONITORING OF BIOASSAYS

The overlying dilution water in the testing chambers was renewed twice daily, approximately every 12 hours. The tests were monitored at initiation (Day 0) for dissolved oxygen, pH, conductivity, ammonia, alkalinity, and hardness, and every 24 hours thereafter for dissolved oxygen and temperature. Dissolved oxygen, pH, conductivity, ammonia, alkalinity, and hardness were monitored at test termination. Mortality was determined at test termination.

RESULTS AND DISCUSSION

SEDIMENT BIOASSAYS

The raw data sheets are presented in Appendix A and the results are summarized in the tables below. Tables 1 and 2 summarize the survival data from the *Hyalella azteca* tests.

Table 1 Summary of Results <i>Hyalella azteca</i> Test date 11/1/99			
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival
	Lab Control	138/160	86.3
	Sediment Control	154/160	96.3
MSED99-32	CO2434-14	69/80	86.3
MSED99-35	CO2434-23	70/80	87.5
MSED99-34	CO2434-20	73/80	91.3
MSED99-16	CO2434-25	74/80	92.5
MSED99-17	CO2434-26	0/80	0.0 ^a
MSED99-20	CO2434-27	69/80	86.3
MSED99-21	CO2434-28	77/80	96.3
MSED99-23	CO2434-29	79/80	98.8
MSED99-39	CO2434-30	78/80	97.5
MSED99-36	CO2434-31	74/80	92.5
MSED99-19	CO2434-32	75/80	96.3
MSED99-38	CO2434-33	70/80	87.5
MSED99-18	CO2434-34	77/80	96.3
MSED99-10	CO2434-35	77/80	96.3
MSED99-13	CO2434-36	76/80	95.0
MSED99-11	CO2434-37	75/80	93.8
MSED99-09	CO2434-38	70/80	88.8
MSED99-14	CO2434-39	69/80	86.3
L13502-52	CO2434-40	78/80	97.5
L13502-54	CO2434-41	78/80	97.5
L13502-55	CO2434-42	73/80	91.3
L13502-56	CO2434-43	79/80	98.8
^a Indicates a statistically significant reduction from Lab control at p less than 0.05 using Wilcoxon Two sample Test.			

Table 2 summarizes the survival data from the *Hyaella azteca* test conducted 11/9/99:

Table 2 Summary of Results <i>Hyaella azteca</i> Test date 11/9/99			
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival
	Lab Control	130/160	81.3
	Sediment Control	134/160	83.8
MSED99-01	CO2434-01	73/80	91.3
MSED99-02	CO2434-02	76/80	95.0
MSED99-03	CO2434-03	57/80	71.3 ^a
MSED99-04	CO2434-04	28/80	35.0 ^a
MSED99-05	CO2434-05	60/80	75.0
MSED99-06	CO2434-06	66/80	82.5
MSED99-07	CO2434-07	22/80	27.5 ^a
MSED99-37	CO2434-08	66/80	82.5
MSED99-22	CO2434-09	62/80	77.5
MSED99-33	CO2434-10	66/80	82.5
MSED99-28	CO2434-11	57/80	71.3
MSED99-24	CO2434-12	58/80	72.5
MSED99-25	CO2434-13	73/80	91.3
MSED99-12	CO2434-22	38/80	47.5 ^a
MSED99-26	CO2434-15	56/80	70.0 ^a
MSED99-27	CO2434-16	49/80	61.3 ^a
MSED99-29	CO2434-17	51/80	63.8 ^a
MSED99-30	CO2434-18	68/80	85.0
MSED99-31	CO2434-19	58/80	72.5
MSED99-15	CO2434-24	44/80	55.0 ^a
MSED99-08	CO2434-21	0/80	0.0 ^a
^a Indicates a statistically significant reduction from Lab control at p less than 0.05 using Wilcoxon Two sample Test.			

Tables 3 and 4 summarize the survival data from the *Chironomus tentans* tests.

Table 3 Summary of Results <i>Chironomus tentans</i> Test date 10/19/99				
OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival	Weight (mg)
	Lab Control	123/160	76.9	1.26
MSED99-01	CO2434-01	63/80	78.8	1.40
MSED99-02	CO2434-02	63/80	78.8	1.55
MSED99-03	CO2434-03	61/80	76.3	1.40
MSED99-04	CO2434-04	66/80	82.5	1.34
MSED99-05	CO2434-05	65/80	81.3	1.46
MSED99-06	CO2434-06	69/80	86.3	1.78
MSED99-07	CO2434-07	68/80	85.0	0.92 ^a
MSED99-37	CO2434-08	73/80	91.3	1.15 ^a
MSED99-22	CO2434-09	71/80	88.8	1.17
MSED99-33	CO2434-10	72/80	90.0	1.50
MSED99-28	CO2434-11	72/80	88.8	1.22
MSED99-24	CO2434-12	72/80	86.3	1.90
MSED99-25	CO2434-13	68/80	85.0	1.84
MSED99-12	CO2434-22	74/80	92.5	1.69
MSED99-26	CO2434-15	74/80	90.0	1.87
MSED99-27	CO2434-16	78/80	95.0	1.88
MSED99-29	CO2434-17	65/80	81.3	1.85
MSED99-30	CO2434-18	75/80	92.5	1.78
MSED99-31	CO2434-19	68/80	85.0	1.82
MSED99-15	CO2434-24	74/80	92.5	1.67
MSED99-08	CO2434-21	68/80	85.0	1.19
^a Indicates a statistically significant reduction from control at p less than 0.05 using Wilcoxon Two-Sample Test.				

Table 4
Summary of Results
Chironomus tentans
 Test date 11/2/99

OAL ID	CH2M HILL Sample ID	# alive/# tested	% Survival	Weight (mg)
	Lab Control	127/160	79.4	1.05
MSED99-32	CO2434-14	72/80	90.0	1.46
MSED99-35	CO2434-23	73/80	88.8	1.28
MSED99-34	CO2434-20	75/80	85.0	1.06
MSED99-16	CO2434-25	76/80	95.0	1.21
MSED99-17	CO2434-26	2/80	2.5 ^a	0.01 ^a
MSED99-20	CO2434-27	59/80	73.8	0.31 ^a
MSED99-21	CO2434-28	61/80	76.3	0.96
MSED99-23	CO2434-29	56/80	70.0	1.08
MSED99-39	CO2434-30	73/80	88.8	1.23
MSED99-36	CO2434-31	73/80	91.3	1.26
MSED99-19	CO2434-32	73/80	91.3	1.68
MSED99-38	CO2434-33	75/80	93.8	1.04
MSED99-18	CO2434-34	74/80	95.0	1.47
MSED99-10	CO2434-35	67/80	83.8	1.12
MSED99-13	CO2434-36	70/80	87.5	0.26 ^a
MSED99-11	CO2434-37	73/80	88.8	1.12
MSED99-09	CO2434-38	63/80	78.8	1.35
MSED99-14	CO2434-39	71/80	88.8	1.28
L13502-52	CO2434-40	68/80	85.0	1.56
L13502-54	CO2434-41	50/80	62.5 ^a	1.20
L13502-55	CO2434-42	61/80	76.3	1.28
L13502-56	CO2434-43	55/80	68.8	1.19
^a Indicates a statistically significant reduction from control at p less than 0.05 using Wilcoxon Two-Sample Test.				

REFERENCE TOXICANT TESTS

The 48-hour LC₅₀ value and 95-percent confidence intervals for the reference toxicant tests (cadmium for *Hyaella azteca* and potassium chloride for *Chironomus tentans*) conducted in October and November are listed below. The results indicate that the organisms were within their expected sensitivity range.

Table 5 Reference Toxicant Tests		
Species	LC ₅₀	95% C.I.
<i>Chironomus tentans</i> (Chi 05)	4.2 g/L	1.0 to 5.2 g/L
<i>Chironomus tentans</i> (Chi 06)	4.9 g/L	1.0 to 5.8 g/L
<i>Hyaella azteca</i> (Amp 36)	3.6 µg/l	0.6 to 19.5 µg/l
<i>Hyaella azteca</i> (Amp 38)	6.5 µg/l	0.5 to 19.2 µg/l



L13502

November 23, 1999

Heather Brunelle
Ecology & Environment, Inc.
333 SW 5th Avenue
Suite 608
Portland, OR 97204

Phone: (503) 248-5600

FAX: (503) 248-5577

Re: Laboratory Sample Analysis
Project: 000749.OA01.00.07.96
McCormick & Baxter
Project Manager: Heather Brunelle

Dear Heather Brunelle:

On October 13 through 19, 1999, OAL received fifty-seven (57) samples for analysis: forty-eight sediment samples; and nine water samples. The samples were analyzed utilizing EPA, ASTM, or equivalent methodology.

Should you have any questions concerning the results in this report, please contact us at (503) 590-5300. Refer to OAL login number L13502.

Sincerely,

Sandra Wright
Client Manager

OREGON ANALYTICAL LABORATORY

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14855 S.W. Scholls Ferry Road, Beaverton, OR 97007
Phone 503-590-5300 • Fax 503-590-1404
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Definition of Terms

D	Reported value is based on a dilution.
D1	Reported value is based on a dilution due to matrix interference.
I1	Reported surrogate recovery outside laboratory QC limits due to suspected matrix interference.
I2	Reporting limit was raised due to matrix interference.
K3	Batch matrix spike recovery outside laboratory QC limits. A post digestion spike was performed and was within acceptable QC limits.
ND	Analytical result was below the reporting limit.
Y	Analysis was subcontracted. A copy of the subcontractor's final report will be made available upon request.

Laboratory Certifications*

<u>Agency</u>	<u>Number</u>
Florida Department of Health	ID #E87569
Oregon Health Division	State Lab #OR020
Washington Department of Ecology	Lab Accreditation #C136
Washington Department of Health	Washington Code #136

* Current Scopes of Accreditation are available upon request.

Analysts

<u>Initials</u>	<u>Analyst</u>	<u>Title</u>
CV	Cheryl Vezzani	Chemist
GCK	Bill Kernion	Chemist
PB	Pat Buddrus	Chemist

Method Summary

<u>Analysis</u>	<u>Method</u>
Arsenic	EPA 200.9
Bioassay	EPA 600/R-94/024
Dioxins and Furans	EPA 1613/8290
Grain Size	ASTM D 422
Polynuclear Aromatic Hydrocarbons (PNA)	EPA 8270 SIM

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L13502

Sample Summary

<u>Sample ID</u>	<u>Lab #</u>	<u>Description</u>	<u>Sampled</u>	<u>Received</u>
MBSE099-01	L13502-1	Sediment	10/12/1999 08:27	10/13/1999 20:00
MBSE099-02	L13502-2	Sediment	10/12/1999 09:07	10/13/1999 20:00
MBSE099-03	L13502-3	Sediment	10/12/1999 09:28	10/13/1999 20:00
MBSE099-04	L13502-4	Sediment	10/12/1999 10:07	10/13/1999 20:00
MBSE099-05	L13502-5	Sediment	10/12/1999 12:22	10/13/1999 20:00
MBSE099-06	L13502-6	Sediment	10/12/1999 15:36	10/13/1999 20:00
MBSE099-07	L13502-7	Sediment	10/12/1999 15:55	10/13/1999 20:00
MBSE099-37	L13502-8	Sediment	10/13/1999 09:50	10/13/1999 20:00
MBSE099-50	L13502-9	Sediment	10/13/1999 10:20	10/13/1999 20:00
MBSE099-22	L13502-10	Sediment	10/13/1999 10:45	10/13/1999 20:00
MBSE099-33	L13502-11	Sediment	10/13/1999 10:00	10/13/1999 20:00
MBSE099-28	L13502-12	Sediment	10/13/1999 10:45	10/13/1999 20:00
MBSE099-08	L13502-13	Sediment	10/13/1999 13:35	10/15/1999 17:20
MBSE099-12	L13502-14	Sediment	10/13/1999 14:38	10/15/1999 17:20
MBSE099-06	L13502-15	Water	10/13/1999 16:30	10/15/1999 17:20
MBSE099-15	L13502-16	Sediment	10/14/1999 07:51	10/15/1999 17:20
MBSE099-16	L13502-17	Sediment	10/14/1999 08:22	10/15/1999 17:20
MBSE099-17	L13502-18	Sediment	10/14/1999 09:25	10/15/1999 17:20
MBSE099-20	L13502-19	Sediment	10/14/1999 11:07	10/15/1999 17:20
MBSE099-21	L13502-20	Sediment	10/14/1999 12:01	10/15/1999 17:20
MBSE099-23	L13502-21	Sediment	10/14/1999 14:11	10/15/1999 17:20
MBSE099-24	L13502-22	Sediment	10/14/1999 15:28	10/15/1999 17:20
MBSE099-25	L13502-23	Sediment	10/14/1999 16:28	10/15/1999 17:20
MBSE099-51	L13502-24	Sediment	10/14/1999 14:30	10/15/1999 17:20
MBSE099-26	L13502-25	Sediment	10/14/1999 08:17	10/15/1999 17:20
MBSE099-27	L13502-26	Sediment	10/15/1999 08:45	10/15/1999 17:20
MBSE099-29	L13502-27	Sediment	10/15/1999 09:09	10/15/1999 17:20
MBSE099-30	L13502-28	Sediment	10/15/1999 09:43	10/15/1999 17:20
MBSE099-31	L13502-29	Sediment	10/15/1999 10:15	10/15/1999 17:20
MBSE099-52	L13502-30	Sediment	10/15/1999 10:50	10/15/1999 17:20
MBSE099-32	L13502-31	Sediment	10/15/1999 13:18	10/18/1999 16:00

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Sample Summary

<u>Sample ID</u>	<u>Lab #</u>	<u>Description</u>	<u>Sampled</u>	<u>Received</u>
MBSE099-34	L13502-32	Sediment	10/15/1999 14:03	10/18/1999 16:00
MBSE099-35	L13502-33	Sediment	10/15/1999 14:20	10/18/1999 16:00
MBSE099-39	L13502-34	Sediment	10/15/1999 15:43	10/18/1999 16:00
MBSE099-36	L13502-35	Sediment	10/15/1999 16:11	10/18/1999 16:00
MBSE099-19	L13502-36	Sediment	10/15/1999 16:24	10/18/1999 16:00
MBSE099-38	L13502-37	Sediment	10/15/1999 15:00	10/18/1999 16:00
MBSE099-18	L13502-38	Sediment	10/16/1999 09:00	10/18/1999 16:00
MBSE099-10	L13502-39	Sediment	10/16/1999 09:15	10/18/1999 16:00
MBSE099-13	L13502-40	Sediment	10/18/1999 09:35	10/18/1999 16:00
MBSE099-53	L13502-41	Sediment	10/18/1999 08:30	10/18/1999 16:00
MBSE099-11	L13502-42	Sediment	10/18/1999 09:50	10/18/1999 16:00
MBSE099-09	L13502-43	Sediment	10/18/1999 09:45	10/18/1999 16:00
MBSE099-14	L13502-44	Sediment	10/18/1999 09:55	10/18/1999 16:00
MBSW99-01	L13502-45	Water	10/18/1999 15:31	10/18/1999 16:40
MBSW99-02	L13502-46	Water	10/18/1999 14:06	10/18/1999 16:40
MBSW99-03	L13502-47	Water	10/18/1999 13:05	10/18/1999 16:40
MBSW99-04	L13502-48	Water	10/18/1999 12:52	10/18/1999 16:40
MBSW99-05	L13502-49	Water	10/18/1999 12:32	10/18/1999 16:40
MBSW99-07	L13502-50	Water	10/18/1999 12:00	10/18/1999 16:40
MBSW99-08	L13502-51	Water	10/18/1999 15:30	10/18/1999 16:40
MBSE099-43	L13502-52	Sediment	10/19/1999 11:30	10/19/1999 15:30
MBSE099-54	L13502-53	Sediment	10/19/1999 11:15	10/19/1999 15:30
MBSE099-40	L13502-54	Sediment	10/19/1999 10:03	10/19/1999 15:30
MBSE099-41	L13502-55	Sediment	10/19/1999 10:42	10/19/1999 15:30
MBSE099-42	L13502-56	Sediment	10/19/1999 11:07	10/19/1999 15:30
MBSE099-09	L13502-57	Water	10/19/1999 10:30	10/19/1999 15:30

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Laboratory**

14855 SW Scholls Ferry Rd
Beaverton OR 97007
(503) 590-3300
FAX (503) 590-1404
1-800-644-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sampling: ☒ Grab ☐ Comp Page 1 of 12
OAL Hours _____ Site Visit ☐
ISCO _____
www.oalab.com/oal

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave, St 609
Portland, Oregon 97204
Phone # 248 5600 Fax # 248 5577

Billing Information

Company Ecology & Environment, Inc.
Contact Peter Geiser
Address 333 SW Fifth Ave, St 609
Portland, Oregon 97204
Phone # 248 5600 Fax # 248 5577

Project Information

Project Name _____
Project # 000749.OAD1.00.07.96.01
P.O. # _____
Comments _____

Sampler's Name Michael Wimmer
Signature [Signature]

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

				Matrix		Analyses												Turnaround	Remarks
Sample Identification	Date	Time	FOR LAB USE ONLY OAL Login #	# of Containers	Soil	Water	Other (Note in Remarks)	Volatiles 620 / 8260 / 8240 3010 / 8020	Semivolatiles 625 / 8270 PAHs 520 PAHs 310 FOP	Organochlor Pests 608 / 8081 PCB 608 / 8082	NW TPH-HCD	Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX DXOIL	BTX 602 / 8021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals 202.9 / 7060 GMA Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved Ba Cd Cr Pb Hg Se Ag Other	Screen Size ASTM 0421 0422 Tonzing Testing	Organics / Surfactants EPA 8160.41 8160.43		
1 MBSE099-01	10/13/99	0827	L13502-1	3			X	X							X	X	X	0	Sediment 1-8 oz
2 MBSE099-02	10/13/99	0907	-2	3			X	X							X	X	X	0	1-8 oz
3 MBSE099-03	10/13/99	0928	-3	3			X	X							X	X	X	0	1-8 oz
4 MBSE099-04	10/13/99	1007	-4	3			X	X							X	X	X	0	1-8 oz
5 MBSE099-05	10/13/99	1222	-5	4			X	X							X	X	X	0	2-8 oz
6 MBSE099-06	10/13/99	1536	-6	3			X	X							X	X	X	0	1-8 oz
7 MBSE099-07	10/13/99	1555	-7	3			X	X							X	X	X	0	1-8 oz
8																			
9																			

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - 14 day Normal
28 day package
(see quote 35)

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13/99</u>
Print Name <u>Heather Brunelle</u>	Time <u>12:40</u>
Company <u>Ecology & Environment, Inc.</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Michael McCad.</u>	Time <u>12:40</u>
Company <u>OAL</u>	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Michael McCad.</u>	Time <u>1:25</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Michael McCad.</u>	Time <u>1:30</u>
Company <u>PSI</u>	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>[Signature]</u>	Time <u>5:45</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Karen Morrow</u>	Time <u>8:00pm</u>
Company <u>OAL</u>	

<input type="checkbox"/> Courier <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input checked="" type="checkbox"/> Other
Received @ <u>-2:00</u>
Applicable Containers <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4oz / 1oz jars
VOA Vials
Plastic Bottles
Glass Bottles
Other
<u>Custom seal in</u>



Oregon
Analytical
Laboratory

55 SW Jones Ferry Rd
Beaverton OR 97007
(503) 590-5300
FAX (503) 590-1404
1-800-644-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sampling: ☒ Grab ☐ Comp Page 2 of 2
OAL Hours _____ Site Visit ☐
ISCO _____
www.oalab.com/oal

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave Ste 609
Portland, OR 97204
Phone # 248 5000 Fax # 248 5577

Billing Information

Company Ecology & Environment, Inc.
Contact Peter Gerger
Address 333 SW Fifth Ave Ste 609
Portland, OR 97204
Phone # 248 5000 Fax # 248 5577

Project Information

Project Name _____
Project # 00749-OA01-00.07.96.01
P.O. # _____
Comments _____

Sampler's Name Heather Brunelle
Signature [Signature]

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

Sample Identification				Date	Time	FOR LAB USE ONLY OAL Login #	# of Containers	Matrix			Analyses										Turnaround	Remarks
								Soil	Water	Other (Note in Remarks)	Volatiles 620 / 6260 / 6240 8010 / 8020	Semivolatiles 625 / 6270 PMT(SM) 6270 / PAH(S) 310 Organochlor Pest 608 / 8081 PCB 608 / 8082	NW TPH-HCD	Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX OXVOL	BTEX 602 / 6021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals GFAA Sb Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved (As Ba Cd Cr Pb Hg Se Ag Other	Torxref Total	Dioxins/Furans EPA Method 1631 ASTD 0124.042	Green Site		
1	MBSE099-37	10/13/99	0950	113501-5	10/13/99	5	6			X	X					X	X	X	X		0	Sediment MBSE099-37 MSA, SW
2	MBSE099-50	10/13/99	1020	113502-9	10/13/99	9	2			X	X					X	X	X	X		0	Sediment 1-4oz / 1-8oz
3	MBSE099-22	10/13/99	1045	-10	10/13/99	10	4			X	X					X	X	X	X		0	Sediment 1-4oz / 1-8oz
4	MBSE099-33	10/13/99	1000	-11	10/13/99	11	4			X	X					X	X	X	X		0	Sediment 1-4oz / 1-8oz
5	MBSE099-28	10/13/99	1045	-12	10/13/99	12	3			X	X					X	X	X	X		0	Sediment 1-8oz
6																						
7																						
8																						
9																						

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13/99</u>
Print Name <u>Heather Brunelle</u>	Time <u>6:40</u>
Company <u>Ecology & Environment</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Larry Roberts</u>	Time <u>12:40</u>
Company <u>OAL</u>	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Larry Roberts</u>	Time <u>1:25</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Mike Stasko</u>	Time <u>1:35</u>
Company <u>PS2</u>	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/13</u>
Print Name <u>Larry Roberts</u>	Time <u>5:45</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/13/99</u>
Print Name <u>Larry Roberts</u>	Time <u>8:00</u>
Company <u>OAL</u>	

<input type="checkbox"/> Courier <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input checked="" type="checkbox"/> Other
Received @ <u>-2</u> °C
Sealable Containers <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<u>10/300</u> 4oz Boz. Vials
<u>15-8oz</u> VOA Vials
Plastic Bottles
Glass Bottles
Other
Custom seal intact. km



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Analytical
Laboratory**

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1-800-644-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sampling: ☒ Grab ☐ Comp
OAL Hours _____
ISCO _____
www.oalab.com/oal

Page 1 of 2
Site Visit ☐

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5400 Fax # 248-5777

Billing Information

Company Ecology & Environment, Inc.
Contact Peter Geiger
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5400 Fax # 248-5777

Project Information

Project Name _____
Project # 749.0A01.00.07.96.01
P.O. # _____
Comments _____

Sampler's Name Heather Brunelle
Signature [Signature]

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

Remarks				# of Containers	Matrix			Analyses												Turnaround	Remarks
Sample Identification			Date		Time	FOR LAB USE ONLY OAL Login #	Soil	Water	Other (Note in Remarks)	Volatiles 600 / 6200 / 8240 8010 / 8020	Semivolatiles 625 / 8270 PAH(SMD) PAH(S) 6270	Organochlorine Pesticides 608 / 8081 PCB 608 / 8082	MW TPH-HCD Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	MW TPH Quantification GX DXJOL	BTEX 602 / 8021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalenes	Metals Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved As Ba Cd Cr Pb Hg Se Ag Other	Geo Size ASTM D 422	Toxicity Test	Dioxin/Furan		
1	MBSE099-08			10/13/99	1335	L13502-13	3			X						X	X	X		0	Sediment
2	MBSE099-12			10/13/99	1435	14-2	3			X						X	X	X		0	Sediment
3	MBSE099-06			10/13/99	1630	15-3	3		X							X				0	
4	MBSE099-15			10/14/99	0751	16-4	3			X						X	X	X		0	Sediment
5	MBSE099-16			10/14/99	0822	17-5	4			X						X	X	X	X	0	Sediment
6	MBSE099-17			10/14/99	0925	18-6	3			X						X	X	X		0	Sediment - high PAH conc. expected
7	MBSE099-20			10/14/99	1107	19-7	3			X						X	X	X		0	Sediment
8	MBSE099-21			10/14/99	1201	20-8	4			X						X	X	X	X	0	Sediment
9	MBSE099-23			10/14/99	1411	21-9	3			X						X	X	X		0	Sediment

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - See Quote 35

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - See Quote 35

Relinquished	
Signature <u>[Signature]</u> Print Name <u>Heather Brunelle</u> Company <u>Ecology & Environment, Inc.</u>	Date <u>10/15/99</u> Time <u>12:40</u>
Received	
Signature <u>[Signature]</u> Print Name <u>Lizbeth Roberts</u> Company <u>OAL</u>	Date <u>10/15</u> Time <u>12:40</u>

Relinquished	
Signature <u>[Signature]</u> Print Name <u>Lizbeth Roberts</u> Company <u>OAL</u>	Date <u>10/15</u> Time <u>1:30</u>
Received	
Signature <u>[Signature]</u> Print Name <u>Davie Hays</u> Company _____	Date <u>10.15.99</u> Time <u>1:30</u>

Relinquished	
Signature <u>[Signature]</u> Print Name <u>[Signature]</u> Company <u>OAL</u>	Date <u>10/15</u> Time <u>5:00</u>
Received	
Signature <u>[Signature]</u> Print Name <u>Cathy Evans</u> Company <u>OAL</u>	Date <u>10-15-99</u> Time <u>1720</u>

<input checked="" type="checkbox"/> Courier <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Other
Received @ <u>5</u> °C
Appropriate Containers <input type="checkbox"/> Yes <input type="checkbox"/> No
_____ 4oz./8oz. Jars
_____ VOA Vials
_____ Plastic Bottles
_____ Glass Bottles
_____ Other _____

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Client Information
Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Billing Information
Company Ecology & Environment, Inc.
Contact Peter Gerken
Address 333 SW Fifth Ave Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Project Information
Project Name _____
Project # 749. OACI. 01. 07. 96. 01
P.O. # _____
Comments _____

Sampler's Name Heather Brunelle
Signature [Signature]
Quote # 35
NOTE: If quote number is not referenced,
standard pricing will be applied.
Provide Fax Results ☐ Yes ☐ No

Remarks				# of Containers	Matrix			Analyses												Turnaround	Remarks
Sample Identification			Date		Time	FOR LAB USE ONLY OAL Login #	Soil	Water	Other (Note in Remarks)	Volatiles 620 / 8260 / 8240 9010 / 8020	Semivolatiles 625 / 8270 PCB(SAR) PAH(S)10 (R)	Organochlor Pest 608 / 8081 PCB 608 / 8082	NW TPH-HCD Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX DVOIL	BTEX 602 / 8021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved Pb Cu Cr Pb Hg Se Ag Other	Gran Size ASTM 0425, 0475, 0600, 0750, 1060, 1250, 1500, 2000, 2500, 3000, 3500, 4250, 4750, 5000, 6000, 8000, 10000, 12500, 15000, 20000, 25000, 30000, 35000, 40000, 45000, 50000, 60000, 80000, 100000, 125000, 150000, 200000, 250000, 300000, 350000, 400000, 450000, 500000, 600000, 800000, 1000000, 1250000, 1500000, 2000000, 2500000, 3000000, 3500000, 4000000, 4500000, 5000000, 6000000, 8000000, 10000000, 12500000, 15000000, 20000000, 25000000, 30000000, 35000000, 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2000000000000000000, 2500000000000000000, 3000000000000000000, 3500000000000000000, 4000000000000000000, 4500000000000000000, 5000000000000000000, 6000000000000000000, 8000000000000000000, 10000000000000000000, 12500000000000000000, 15000000000000000000, 20000000000000000000, 25000000000000000000, 30000000000000000000, 35000000000000000000, 40000000000000000000, 45000000000000000000, 50000000000000000000, 60000000000000000000, 80000000000000000000, 100000000000000000000, 125000000000000000000, 150000000000000000000, 200000000000000000000, 250000000000000000000, 300000000000000000000, 350000000000000000000, 400000000000000000000, 450000000000000000000, 500000000000000000000, 600000000000000000000, 800000000000000000000, 1000000000000000000000, 1250000000000000000000, 1500000000000000000000, 2000000000000000000000, 2500000000000000000000, 3000000000000000000000, 3500000000000000000000, 4000000000000000000000, 4500000000000000000000, 5000000000000000000000, 6000000000000000000000, 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3500000000000000000000000000000, 4000000000000000000000000000000, 4500000000000000000000000000000, 5000000000000000000000000000000, 6000000000000000000000000000000, 8000000000000000000000000000000, 10000000000000000000000000000000, 12500000000000000000000000000000, 15000000000000000000000000000000, 20000000000000000000000000000000, 25000000000000000000000000000000, 30000000000000000000000000000000, 35000000000000000000000000000000, 40000000000000000000000000000000, 45000000000000000000000000000000, 50000000000000000000000000000000, 60000000000000000000000000000000, 80000000000000000000000000000000, 100000000000000000000000000000000, 125000000000000000000000000000000, 150000000000000000000000000000000, 200000000000000000000000000000000, 250000000000000000000000000000000, 300000000000000000000000000000000, 350000000000000000000000000000000, 400000000000000000000000000000000, 450000000000000000000000000000000, 500000000000000000000000000000000, 600000000000000000000000000000000, 800000000000000000000000000000000, 1000000000000000000000000000000000, 1250000000000000000000000000000000, 1500000000000000000000000000000000, 2000000000000000000000000000000000, 2500000000000000000000000000000000, 3000000000000000000000000000000000, 3500000000000000000000000000000000, 4000000000000000000000000000000000, 4500000000000000000000000000000000, 5000000000000000000000000000000000, 6000000000000000000000000000000000, 8000000000000000000000000000000000, 10000000000000000000000000000000000, 12500000000000000000000000000000000, 15000000000000000000000000000000000, 20000000000000000000000000000000000, 25000000000000000000000000000000000, 30000000000000000000000000000000000, 35000000000000000000000000000000000, 40000000000000000000000000000000000, 45000000000000000000000000000000000, 50000000000000000000000000000000000, 60000000000000000000000000000000000, 80000000000000000000000000000000000, 100000000000000000000000000000000000, 125000000000000000000000000000000000, 150000000000000000000000000000000000, 200000000000000000000000000000000000, 250000000000000000000000000000000000, 300000000000000000000000000000000000, 350000000000000000000000000000000000, 400000000000000000000000000000000000, 450000000000000000000000000000000000, 500000000000000000000000000000000000, 600000000000000000000000000000000000, 800000000000000000000000000000000000, 1000000000000000000000000000000000000, 1250000000000000000000000000000000000, 1500000000000000000000000000000000000, 2000000000000000000000000000000000000, 2500000000000000000000000000000000000, 3000000000000000000000000000000000000, 3500000000000000000000000000000000000, 4000000000000000000000000000000000000, 4500000000000000000000000000000000000, 5000000000000000000000000000000000000, 6000000000000000000000000000000000000, 8000000000000000000000000000000000000, 10000000000000000000000000000000000000, 12500000000000000000000000000000000000, 15000000000000000000000000000000000000, 20000000000000000000000000000000000000, 25000000000000000000000000000000000000, 30000000000000000000000000000000000000, 35000000000000000000000000000000000000, 40000000000000000000000000000000000000, 45000000000000000000000000000000000000, 50000000000000000000000000000000000000, 60000000000000000000000000000000000000, 80000000000000000000000000000000000000, 100000000000000000000000000000000000000, 125000000000000000000000000000000000000, 150000000000000000000000000000000000000, 200000000000000000000000000000000000000, 250000000000000000000000000000000000000, 300000000000000000000000000000000000000, 350000000000000000000000000000000000000, 400000000000000000000000000000000000000, 450000000000000000000000000000000000000, 500000000000000000000000000000000000000, 600000000000000000000000000000000000000, 800000000000000000000000000000000000000, 1000000000000000000000000000000000000000, 1250000000000000000000000000000000000000, 1500000000000000000000000000000000000000, 2000000000000000000000000000000000000000, 2500000000000000000000000000000000000000, 3000000000000000000000000000000000000000, 3500000000000000000000000000000000000000, 4000000000000000000000000000000000000000, 4500000000000000000000000000000000000000, 5000000000000000000000000000000000000000, 6000000000000000000000000000000000000000, 8000000000000000000000000000000000000000, 100, 12500000000000000000000000000000000000000, 15000000000000000000000000000000000000000, 200, 25000000000000000000000000000000000000000, 300, 35000000000000000000000000000000000000000, 400, 45000000000000000000000000000000000000000, 500, 600, 800, 1000, 1250000000000000000000000000000				



Oregon
Analytical
Laboratory

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Beaverton OR 97007
(503) 590-5300
FAX (503) 590-1404
1-800-844-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sampling: ☒ Grab ☐ Comp Page 1 of 2
OAL Hours _____ Site Visit ☐
ISCO _____
www.oalab.com/oal

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Billing Information

Company Ecology & Environment, Inc.
Contact Peter Gergel
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Project Information

Project Name _____
Project # 000749. OAPL. 04.07.96.01
P.O. # _____
Comments _____

Sampler's Name Heather Brunelle
Signature [Signature]

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

Remarks				# of Containers	Matrix			Analyses															Turnaround	Remarks
Sample Identification					Date	Time	FOR LAB USE ONLY OAL Login #	Soil	Water	Other (Note in Remarks)	Volatiles 620 / 6260 / 6240 9010 / 9020	Semivolatiles 625 / 6270 PAH(S) 6270 PAH(S) 6310	Organochlorine Pesticides 608 / 6081 PCB 608 / 6082	NW TPH-HCID Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX DMAOL	BTEX 602 / 6021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals <input checked="" type="checkbox"/> Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved Cd Ba Cd Cr Pb Hg Se Ag Other	Gran Size	Toxicity Testing	Dioxins / Furans				
1	MBSE099-32			10/15/99	1318	L13502-31	3			X	X						X	X	X			0	Sediment	
2	MBSE099-34			10/15/99	1403	-32	3			X	X						X	X	X			0		
3	MBSE099-35			10/15/99	1420	-33	3			X	X						X	X	X			0		
4	MBSE099-39			10/15/99	1543	-34	3			X	X						X	X	X			0		
5	MBSE099-36			10/15/99	1611	-35	3			X	X						X	X	X			0		
6	MBSE099-19			10/15/99	1624	-36	5			X	X						X	X	X	X		0	2 containers for Dioxins	
7	MBSE099-38			10/15/99	1500	-37	3			X	X						X	X	X			0		
8	MBSE099-18			10/16/99	0900	-38	5			X	X						X	X	X	X		0	2 containers for Dioxins	
9	MBSE099-10			10/16/99	0915	N -39	3			X	X						X	X	X			0	✓	

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - see Quote 35

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/18/99</u>
Print Name <u>Heather Brunelle</u>	Time <u>12:45</u>
Company <u>Ecology & Environment, Inc.</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/18/99</u>
Print Name <u>Leahy Robles</u>	Time <u>10:18</u>
Company <u>OAL</u>	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/18</u>
Print Name <u>Leahy Robles</u>	Time <u>1:30</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10.18.99</u>
Print Name <u>Davie Hajeck</u>	Time <u>1:30</u>
Company _____	

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/18</u>
Print Name <u>[Signature]</u>	Time <u>3:00</u>
Company <u>OAL</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10-18-99</u>
Print Name <u>Cathy Evans</u>	Time <u>1600</u>
Company <u>OAL</u>	

<input type="checkbox"/> Courier	<input type="checkbox"/> UPS	<input type="checkbox"/> FedEx	<input type="checkbox"/> Other
Received @ <u>8</u> °C			
Appropriate Containers <input type="checkbox"/> Yes <input type="checkbox"/> No			
4oz./8oz. Jars			
VOA Vials			
Plastic Bottles			
Glass Bottles			
Other _____			



Ore
Analytical
Laboratory

1065 SW 8th Ferry
Beaverton OR 97007
(503) 590-5300
FAX (503) 590-1404
1-800-844-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sample # 7 Gra Comp Page 1 of 1
OAL Hours Site Visit ☐
ISCO
www.oalab.com/oal

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Billing Information

Company Ecology & Environment, Inc.
Contact Peter Geiser
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Project Information

Project Name
Project # 000749. OAPL 00.07.96.p
P.O. #
Comments

Sampler's Name Heather Brunelle
Signature Heather Brunelle

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

							# of Containers	Matrix												Analysis			
Sample Identification			Date	Time	FOR LAB USE ONLY OAL Login #	Soil		Water	Other (Note in Remarks)	Volatiles 820 / 8260 / 8240 9010 / 8020	Semivolatiles 825 / 8270 PAHs 8310	Organochlorine Pest 608 / 8081 PCB 608 / 8082	NW TPH-HCD Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX DX/OIL	BTEX 602 / 8021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals Cd <input type="checkbox"/> Ba <input type="checkbox"/> Cr <input type="checkbox"/> Pb <input type="checkbox"/> Hg <input type="checkbox"/> Se <input type="checkbox"/> Ag Other _____	Grain Size	Toxicology Testing	Dioxin / Furans				
1	MBSE099-13	10/14/99	0935	L1350240	3			X		X					X	X	X						
2	MBSE099-53	10/18/99	0830	-41	1			X		X					X	X	X						
3	MBSE099-11	10/18/99	0950	-42	9			X		X					X	X	X						
4	MBSE099-09	10/18/99	0945	-43	3			X		X					X	X	X						
5	MBSE099-14	10/18/99	0955	-44	3			X		X					X	X	X						
6																							
7																							
8																							
9																							

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - See Quote 35

Turnaround

Remarks

0 Sediment
0 Sediment (SVOCs and As only)
0 Sediment MS/MSD D
0 Sediment
0 Sediment 2 Dioxin Contaminants

Relinquished

Signature Heather Brunelle Date 10/18/99
Print Name Heather Brunelle Time 12:45
Company Ecology & Environment, Inc.

Received

Signature Lejia T. Rolles Date 10/18
Print Name Lejia Rolles Time 12:50
Company OAL

Relinquished

Signature Lejia T. Rolles Date 10/18
Print Name Lejia Rolles Time 1:30
Company OAL

Received

Signature Davie Hajek Date 10.18.99
Print Name Davie Hajek Time 1:30
Company OAL

Relinquished

Signature Lejia T. Rolles Date 10/18
Print Name Lejia Rolles Time 3:00
Company OAL

Received

Signature Cathy Evans Date 10-18-99
Print Name Cathy Evans Time 1600
Company OAL

☐ Courier ☐ UPS ☐ FedEx ☐ Other
Received @ 8 °C
Appropriate Containers ☒ Yes ☐ No
4oz./Boz. Jars
VOA Vials
Plastic Bottles
Glass Bottles
Other



Oregon
Analytical
Laboratory

14855 SW Scholls Ferry Rd
Beaverton OR 97007
(503) 590-5300
FAX (503) 590-1404
1-800-644-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sampling: ☒ Grab ☐ Comp Page 1 of 1
OAL Hours _____ Site Visit ☐
ISCO _____
www.oalab.com/oal

Client Information

Company Ecology & Environmental
Contact Heather Brunelle
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Billing Information

Company Ecology & Environmental
Contact Peter Berger
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Project Information

Project Name _____
Project # 000749.OA01.00-07.96.01
P.O. # _____
Comments _____

Sampler's Name Heather Brunelle

Signature [Signature]

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

Matrix

Analyses

Sample Identification				Date	Time	FOR LAB USE ONLY OAL Login #	# of Containers	Soil	Water	Other (Note in Remarks)	Volatiles 620 / 6260 / 6240 6010 / 6020	Semivolatiles 625 / 6270 PAH(SM) 6270 PAH310 (PCP)	Organochlor Pest 608 / 6081 PCB 608 / 6082	NW TPH-HCD	Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification G X DX/OIL	BTEX 602 / 6021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved As Ba Cd Cr Pb Hg Se Ag Other	Turnaround	Remarks
1	MBSW99-01	10/18/99	1531	L13502-458	8	X				X								X		0
2	MBSW99-02	10/18/99	1406	-463	3	X			X								X		0	
3	MBSW99-03	10/18/99	1305	-473	3	X			X								X		0	
4	MBSW99-04	10/18/99	1252	-483	3	X			X								X		0	
5	MBSW99-05	10/18/99	1232	-493	3	X			X								X		0	
6	MBSW99-07	10/18/99	1200	-503	3	X			X								X		0	
7	MBSW99-08	10/18/99	1530	✓ -513	3	X			X								X		0	
8																				
9																				

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - See Quote 55

[N] Normal - 10 working days
[S] Special - 5 working days
[R] Rush - 24-72 hrs
[O] Other - See Quote 35

Relinquished	
Signature <u>[Signature]</u>	Date <u>10/18/99</u>
Print Name <u>Heather Brunelle</u>	Time <u>1640</u>
Company <u>Ecology & Environmental</u>	
Received	
Signature <u>[Signature]</u>	Date <u>10/18/99</u>
Print Name <u>Doug McKenzie</u>	Time <u>1640</u>
Company <u>OAL</u>	

Relinquished	
Signature _____	Date _____
Print Name _____	Time _____
Company _____	
Received	
Signature _____	Date _____
Print Name _____	Time _____
Company _____	

Relinquished	
Signature _____	Date _____
Print Name _____	Time _____
Company _____	
Received	
Signature _____	Date _____
Print Name _____	Time _____
Company _____	

☐ Courier ☐ UPS ☐ FedEx ☒ Other Client
Received @ _____ °C
Appropriate Containers ☒ Yes ☐ No
____ 4oz./8oz. Jars
____ VOA Vials
____ Plastic Bottles
____ Glass Bottles
____ Other _____



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Analytical
Laboratory

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FAX (503) 590-1404
1-800-644-0967

CHAIN OF CUSTODY RECORD LABORATORY ANALYSIS REQUEST

Sample # _____ Gra _____ Comp _____ Page _____ of _____
OAL Hours _____ Site Visit ☐
ISCO _____
www.oalab.com/oal

Client Information

Company Ecology & Environment, Inc.
Contact Heather Brunelle
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Billing Information

Company Ecology & Environment, Inc.
Contact Paul Dexter Gerger
Address 333 SW Fifth Ave, Ste 609
Portland, OR 97204
Phone # 248-5600 Fax # 248-5577

Project Information

Project Name _____
Project # 000749.0Apl.0p.07.96.0
P.O. # _____
Comments _____

Sampler's Name _____

Signature _____

Quote # 35

NOTE: If quote number is not referenced,
standard pricing will be applied.

Provide Fax Results ☐ Yes ☐ No

Remarks

Matrix

Analyses

Sample Identification				Date	Time	FOR LAB USE ONLY OAL Login #	# of Containers	Soil	Water	Other (Note in Remarks)	Volatiles 620 / 8260 / 8240 8010 / 8020	Semivolatiles 625 / 8270 PAHs 8270 PAHs 8310 PCP Organochlor Pestic 608 / 8081 PCB 608 / 8082	NW TPH-HCD	Quantity? <input type="checkbox"/> Yes <input type="checkbox"/> No	NW TPH Quantification GX DXOIL	BTEX 602 / 8021 <input type="checkbox"/> MTBE <input type="checkbox"/> Naphthalene	Metals Total <input type="checkbox"/> TCLP <input type="checkbox"/> Dissolved Ba Cd Cr Pb Hg Se Ag Other	Grain Size Toxicity	Turnaround	Remarks
1	MBSE099-43		10/19/99	1130	L13502-523	3			X		X						X	X	0	Sediment * need (5) containers
2	MBSE099-54		10/19/99	1115	-531	1			X		X						X	X	0	Sediment
3	MBSE099-40		10/19/99	1003	-543	3			X		X						X	X	0	Sediment
4	MBSE099-41		10/19/99	1042	-553	3			X		X						X	X	0	Sediment
5	MBSE099-42		10/19/99	1107	-563	3			X		X						X	X	0	Sediment
6	MBSW99-09		10/19/99	1030	-573	3		X			X						X		0	
7																				
8																				
9																				

Normal - 10 working days

Special - 5 working days

Rush - 24-72 hrs

Other - See Quote 35

Relinquished

Signature Heather Brunelle Date 10/19/99
Print Name Heather Brunelle Time 1530
Company Ecology & Environment, Inc.

Received

Signature Doug McKenzie Date 10/19/99
Print Name Doug McKenzie Time 1530
Company OAL

Relinquished

Signature _____ Date _____
Print Name _____ Time _____
Company _____

Received

Signature _____ Date _____
Print Name _____ Time _____
Company _____

Relinquished

Signature _____ Date _____
Print Name _____ Time _____
Company _____

Received

Signature _____ Date _____
Print Name _____ Time _____
Company _____

☐ Courier ☐ UPS ☐ FedEx ☒ Other clerk
Received @ _____ °C
Appropriate Containers ☒ Yes ☐ No

4oz / Boz. Jars

VOA Vials

Plastic Bottles

Glass Bottles

Other _____



L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Total Metals

<u>Sample ID</u>	<u>Matrix</u>								<u>Lab Number</u>
Analyte		Result	Reporting Limit	Units (ppm)	Dil-ution	Date Analyzed	Method	Comment	Analyst
Sampled: 10/12/1999									
MBSE099-01	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-1
Arsenic.....		6.1	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-02	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-2
Arsenic.....		5.0	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-03	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-3
Arsenic.....		4.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-04	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-4
Arsenic.....		3.9	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-05	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-5
Arsenic.....		5.3	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-06	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-6
Arsenic.....		2.9	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV
Sampled: 10/12/1999									
MBSE099-07	Sediment	Hot Plate Digestion EPA 200.2/3050A: 10/26/1999							L13502-7
Arsenic.....		6.0	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3	CV

OREGON ANALYTICAL LABORATORY

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14855 S.W. Scholls Ferry Road, Beaverton, OR 97007
Phone 503-590-5300 • Fax 503-590-1404
www.oalab.com • Toll-Free 1-800-644-0967

Client: **Ecology & Environment, Inc.**

Project: **000749.OA01.00.07.96**

Contact: **Heather Brunelle**

McCormick & Baxter

Total Metals

Sample ID	Matrix	Result	Reporting Limit	Units (ppm)	Dilution	Date Analyzed	Method	Lab Number	Comment	Analyst
Analyte										
Sampled: 10/13/1999										
MBSE099-37	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-8		
Arsenic		7.8	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-50	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-9		
Arsenic		11.1	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-22	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-10		
Arsenic		7.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-33	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-11		
Arsenic		11.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-28	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-12		
Arsenic		4.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-08	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-13		
Arsenic		3.5	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
Sampled: 10/13/1999										
MBSE099-12	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-14		
Arsenic		3.5	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Total Metals

<u>Sample ID</u>	<u>Matrix</u>							<u>Lab Number</u>
Analyte		Result	Reporting Limit	Units (ppm)	Dilution	Date Analyzed	Method	Comment Analyst
Sampled: 10/13/1999								
MBSE099-06	Water						Hot Plate Digestion EPA 200.2/3005A: 10/20/1999	L13502-15
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9	GCK
Sampled: 10/14/1999								
MBSE099-15	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-16
Arsenic		4.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3 CV
Sampled: 10/14/1999								
MBSE099-16	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-17
Arsenic		8.1	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3 CV
Sampled: 10/14/1999								
MBSE099-17	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-18
Arsenic		6.1	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3 CV
Sampled: 10/14/1999								
MBSE099-20	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-19
Arsenic		4.4	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1 CV
Sampled: 10/14/1999								
MBSE099-21	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-20
Arsenic		5.7	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3 CV
Sampled: 10/14/1999								
MBSE099-23	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-21
Arsenic		4.3	1.0	mg/kg	5.	11/1/1999	EPA 200.9	D1,K3 CV

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[Signature] 11/1/99 - 3 -

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Total Metals

Sample ID	Matrix	Result	Reporting Limit	Units (ppm)	Dilution	Date Analyzed	Method	Lab Number	Comment	Analyst
MBSE099-24	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/26/1999	L13502-22	
Arsenic.....		4.2	1.0	mg/kg	5.	11/1/1999	EPA 200.9		D1,K3	CV
								Sampled: 10/14/1999		
BSE099-25	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-23	
Arsenic.....		4.7	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV
								Sampled: 10/14/1999		
BSE099-51	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-24	
Arsenic.....		8.9	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV
								Sampled: 10/14/1999		
MBSE099-26	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-25	
Arsenic.....		4.8	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV
								Sampled: 10/15/1999		
MBSE099-27	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-26	
Arsenic.....		5.6	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV
								Sampled: 10/15/1999		
BSE099-29	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-27	
Arsenic.....		5.0	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV
								Sampled: 10/15/1999		
MBSE099-30	Sediment							Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-28	
Arsenic.....		4.9	1.0	mg/kg	5.	11/2/1999	EPA 200.9		D1	CV

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[Signature] 4
12/1/99



Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Total Metals

<u>Sample ID</u>	<u>Matrix</u>							<u>Lab Number</u>	
Analyte		Result	Reporting Limit	Units (ppm)	Dil-ution	Date Analyzed	Method	Comment	Analyst
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-31SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-29</div> </div>									
Arsenic.....		4.6	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-52SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-30</div> </div>									
Arsenic.....		4.1	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-32SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-31</div> </div>									
Arsenic.....		5.6	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-34SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-32</div> </div>									
Arsenic.....		5.9	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-35SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-33</div> </div>									
Arsenic.....		4.3	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-39SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-34</div> </div>									
Arsenic.....		4.0	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV
<div> <div>Sampled: 10/15/1999</div> <div>MBSE099-36SedimentHot Plate Digestion EPA 200.2/3050A: 10/29/1999L13502-35</div> </div>									
Arsenic.....		4.0	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV

OREGON ANALYTICAL LABORATORY

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14855 S.W. Scholls Ferry Road, Beaverton, OR 97007
Phone 503-590-5300 • Fax 503-590-1404
www.oalab.com • Toll-Free 1-800-644-0967



Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Total Metals

Sample ID	Matrix	Result	Reporting Limit	Units (ppm)	Dilution	Date Analyzed	Method	Lab Number	Comment	Analyst
Analyte										
Sampled: 10/15/1999										
MBSE099-19	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-36		
Arsenic		3.9	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/15/1999										
BSE099-38	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-37		
Arsenic		5.7	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/16/1999										
BSE099-18	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-38		
Arsenic		7.0	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/16/1999										
MBSE099-10	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-39		
Arsenic		3.4	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/18/1999										
MBSE099-13	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-40		
Arsenic		4.3	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/18/1999										
BSE099-53	Sediment						Hot Plate Digestion EPA 200.2/3050A: 10/29/1999	L13502-41		
Arsenic		3.0	1.0	mg/kg	5.	11/2/1999	EPA 200.9	D1	CV	
Sampled: 10/18/1999										
MBSE099-11	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-42		
Arsenic		4.6	1.0	mg/kg	5.	11/3/1999	EPA 200.9	D1	CV	

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Total Metals

<u>Sample ID</u>	<u>Matrix</u>							<u>Lab Number</u>	
Analyte		Result	Reporting Limit	Units (ppm)	Dil-ution	Date Analyzed	Method	Comment	Analyst
<div> <div>MBSE099-09</div> <div>Sediment</div> <div>Hot Plate Digestion EPA 200.2/3050A: 11/2/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-43</div> </div>									
Arsenic		3.7	1.0	mg/kg	5.	11/3/1999	EPA 200.9	D1	CV
<div> <div>MBSE099-14</div> <div>Sediment</div> <div>Hot Plate Digestion EPA 200.2/3050A: 11/2/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-44</div> </div>									
Arsenic		3.2	1.0	mg/kg	5.	11/3/1999	EPA 200.9	D1	CV
<div> <div>MBSW99-01</div> <div>Water</div> <div>Hot Plate Digestion EPA 200.2/3005A: 10/20/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-45</div> </div>									
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK
<div> <div>MBSW99-02</div> <div>Water</div> <div>Hot Plate Digestion EPA 200.2/3005A: 10/20/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-46</div> </div>									
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK
<div> <div>MBSW99-03</div> <div>Water</div> <div>Hot Plate Digestion EPA 200.2/3005A: 10/20/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-47</div> </div>									
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK
<div> <div>MBSW99-04</div> <div>Water</div> <div>Hot Plate Digestion EPA 200.2/3005A: 10/20/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-48</div> </div>									
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK
<div> <div>MBSW99-05</div> <div>Water</div> <div>Hot Plate Digestion EPA 200.2/3005A: 10/20/1999</div> <div>Sampled: 10/18/1999</div> <div>L13502-49</div> </div>									
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Total Metals

Sample ID	Matrix	Result	Reporting Limit	Units (ppm)	Dilution	Date Analyzed	Method	Lab Number	Comment	Analyst
Analyte										
Sampled: 10/18/1999										
MBSW99-07	Water						Hot Plate Digestion EPA 200.2/3005A: 10/20/1999	L13502-50		
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK	
Sampled: 10/18/1999										
BSW99-08	Water						Hot Plate Digestion EPA 200.2/3005A: 10/20/1999	L13502-51		
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9		GCK	
Sampled: 10/19/1999										
MBSE099-43	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-52		
Arsenic		3.0	1.0	mg/kg	5.	11/3/1999	EPA 200.9		D1	CV
Sampled: 10/19/1999										
MBSE099-54	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-53		
Arsenic		3.4	1.0	mg/kg	5.	11/3/1999	EPA 200.9		D1	CV
Sampled: 10/19/1999										
MBSE099-40	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-54		
Arsenic		4.1	1.0	mg/kg	5.	11/3/1999	EPA 200.9		D1	CV
Sampled: 10/19/1999										
MBSE099-41	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-55		
Arsenic		3.3	1.0	mg/kg	5.	11/3/1999	EPA 200.9		D1	CV
Sampled: 10/19/1999										
MBSE099-42	Sediment						Hot Plate Digestion EPA 200.2/3050A: 11/2/1999	L13502-56		
Arsenic		3.5	1.0	mg/kg	5.	11/3/1999	EPA 200.9		D1	CV

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Total Metals

<u>Sample ID</u>	<u>Matrix</u>							<u>Lab Number</u>
Analyte		Result	Reporting Limit	Units (ppm)	Dil-ution	Date Analyzed	Method	Comment Analyst
Sampled: 10/19/1999								
MBSE099-09	Water						Hot Plate Digestion EPA 200.2/3005A: 10/20/1999	L13502-57
Arsenic		ND	0.0020	mg/L		10/20/1999	EPA 200.9	GCK

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Dioxins and Furans by EPA 1613/8290

Sample ID	Matrix	Result	Reporting Limit	Units	Dilution	Comment	Lab Number
CAS	Analyte						
MBSE099-05	Sediment						L13502-5
	See Attached Data Sheet					Y	
MBSE099-37	Sediment						L13502-8
	See Attached Data Sheet					Y	
MBSE099-50	Sediment						L13502-9
	See Attached Data Sheet					Y	
MBSE099-22	Sediment						L13502-10
	See Attached Data Sheet					Y	
MBSE099-33	Sediment						L13502-11
	See Attached Data Sheet					Y	
MBSE099-16	Sediment						L13502-17
	See Attached Data Sheet					Y	
MBSE099-21	Sediment						L13502-20
	See Attached Data Sheet					Y	

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L13502

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Project: **000749.OA01.00.07.96**
McCormick & Baxter

Dioxins and Furans
by EPA 1613/8290

Sample ID	Matrix	Result	Reporting Limit	Units	Dilution	Comment	Lab Number
CAS	Analyte						
MBSE099-25	Sediment						L13502-23
See Attached Data Sheet.....						Y	
MBSE099-19	Sediment						L13502-36
See Attached Data Sheet.....						Y	
MBSE099-18	Sediment						L13502-38
See Attached Data Sheet.....						Y	
MBSE099-11	Sediment						L13502-42
See Attached Data Sheet.....						Y	
MBSE099-14	Sediment						L13502-44
See Attached Data Sheet.....						Y	

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-01</div> <div>Sediment</div> <div> <div>Sampled: 10/12/1999</div> <div>Extracted: 10/15/1999</div> <div>Analyzed: 10/18/1999 by PB</div> </div> <div>L13502-1</div> </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
3-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
7-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
5-01-8	Phenanthrene.....	16.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
06-44-0	Fluoranthene.....	40.	10.	µg/kg		
29-00-0	Pyrene.....	39.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	22.	10.	µg/kg		
18-01-9	Chrysene.....	28.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	37.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	16.	10.	µg/kg		
0-32-8	Benzo[a]pyrene.....	27.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	11.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene.....	14.	10.	µg/kg		
	Surrogate		Recovery	Limit		
	2-Fluorophenol		85. %	64. - 124.		
	Phenol-d6		87. %	30 - 159.		
	2,4,6-Tribromophenol		85. %	0 - 224.		
	1,2-Dichlorobenzene-d4		87. %	59. - 134.		
	Nitrobenzene-d5		91. %	42. - 142.		
	2-Fluorobiphenyl		88. %	57. - 135.		

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Project: **000749.0A01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSE099-02		Sediment		Sampled: 10/12/1999 Extracted: 10/15/1999 Analyzed: 10/18/1999 by PB			L13502-2
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene.....	ND	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene	22.	10.	µg/kg			
129-00-0	Pyrene	21.	10.	µg/kg			
56-55-3	Benzo[a]anthracene	11.	10.	µg/kg			
218-01-9	Chrysene	14.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene	17.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg			
50-32-8	Benzo[a]pyrene	12.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		89. %		64. - 124.			
Phenol-d6		91. %		30 - 159.			
2,4,6-Tribromophenol		85. %		0 - 224.			
1,2-Dichlorobenzene-d4		86. %		59. - 134.			
Nitrobenzene-d5		94. %		42. - 142.			
2-Fluorobiphenyl		85. %		57. - 135.			

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Client: **Ecology & Environment, Inc.**

Project: **000749.0A01.00.07.96**

Contact: **Heather Brunelle**

McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-03</div> <div>Sediment</div> <div> <div>Sampled: 10/12/1999</div> <div>Extracted: 10/15/1999</div> <div>Analyzed: 10/18/1999 by PB</div> </div> <div>L13502-3</div> </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
3-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
7-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
5-01-8	Phenanthrene	14.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
06-44-0	Fluoranthene	32.	10.	µg/kg		
29-00-0	Pyrene	30.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	16.	10.	µg/kg		
18-01-9	Chrysene	19.	10.	µg/kg		
05-99-2	Benzo[b]fluoranthene	23.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
0-32-8	Benzo[a]pyrene	15.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
	Surrogate		Recovery		Limit	
	2-Fluorophenol		86. %		64. - 124.	
	Phenol-d6		89. %		30 - 159.	
	2,4,6-Tribromophenol		87. %		0 - 224.	
	1,2-Dichlorobenzene-d4		88. %		59. - 134.	
	Nitrobenzene-d5		94. %		42. - 142.	
	2-Fluorobiphenyl		86. %		57. - 135.	

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

		Sampled: 10/12/1999					
		Extracted: 10/15/1999					
		Analyzed: 10/21/1999 by PB					
MBSE099-04	Sediment						L13502-4
91-20-3	Naphthalene	529.	100	µg/kg	10.	D	
208-96-8	Acenaphthylene	ND	100	µg/kg	10.	D	
83-32-9	Acenaphthene	2,940	100	µg/kg	10.	D	
86-73-7	Fluorene	1,900	100	µg/kg	10.	D	
87-86-5	Pentachlorophenol	ND	600	µg/kg	10.	D	
85-01-8	Phenanthrene	4,370	100	µg/kg	10.	D	
120-12-7	Anthracene	774.	100	µg/kg	10.	D	
206-44-0	Fluoranthene	2,450	100	µg/kg	10.	D	
129-00-0	Pyrene	1,820	100	µg/kg	10.	D	
56-55-3	Benzo[a]anthracene	516.	100	µg/kg	10.	D	
218-01-9	Chrysene	507.	100	µg/kg	10.	D	
205-99-2	Benzo[b]fluoranthene	397.	100	µg/kg	10.	D	
207-08-9	Benzo[k]fluoranthene	144.	100	µg/kg	10.	D	
50-32-8	Benzo[a]pyrene	216.	100	µg/kg	10.	D	
193-39-5	Indeno[1,2,3-cd]pyrene	ND	100	µg/kg	10.	D	
53-70-3	Dibenz[a,h]anthracene	ND	100	µg/kg	10.	D	
191-24-2	Benzo[g,h,i]perylene	ND	100	µg/kg	10.	D	
		Surrogate	Recovery		Limit		
		2-Fluorophenol	75. %		64. - 124.		
		Phenol-d6	77. %		30 - 159.		
		2,4,6-Tribromophenol	59. %		0 - 224.		
		1,2-Dichlorobenzene-d4	80. %		59. - 134.		
		Nitrobenzene-d5	82. %		42. - 142.		
		2-Fluorobiphenyl	79. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

BSE099-05		Sediment		Sampled: 10/12/1999 Extracted: 10/15/1999 Analyzed: 10/21/1999 by PB			L13502-5
91-20-3	Naphthalene.....	ND	10.	µg/kg			
08-96-8	Acenaphthylene.....	ND	10.	µg/kg			
3-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene	19.	10.	µg/kg			
7-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
5-01-8	Phenanthrene	36.	10.	µg/kg			
120-12-7	Anthracene	17.	10.	µg/kg			
06-44-0	Fluoranthene	112.	10.	µg/kg			
29-00-0	Pyrene	108.	10.	µg/kg			
56-55-3	Benzo[a]anthracene	52.	10.	µg/kg			
18-01-9	Chrysene	57.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene	59.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene	28.	10.	µg/kg			
0-32-8	Benzo[a]pyrene	40.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene	16.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene	19.	10.	µg/kg			
<u>Surrogate</u>		<u>Recovery</u>		<u>Limit</u>			
2-Fluorophenol		76. %		64. - 124.			
Phenol-d6		78. %		30 - 159.			
2,4,6-Tribromophenol		69. %		0 - 224.			
1,2-Dichlorobenzene-d4		77. %		59. - 134.			
Nitrobenzene-d5		83. %		42. - 142.			
2-Fluorobiphenyl		77. %		57. - 135.			

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L13502

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Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

		Sampled: 10/12/1999					
		Extracted: 10/15/1999					
		Analyzed: 10/20/1999 by PB					
MBSE099-06	Sediment						L13502-6
91-20-3	Naphthalene.....	ND	10.	µg/kg		D	
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		D	
83-32-9	Acenaphthene.....	ND	10.	µg/kg		D	
86-73-7	Fluorene.....	ND	10.	µg/kg		D	
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		D	
85-01-8	Phenanthrene.....	ND	10.	µg/kg		D	
120-12-7	Anthracene.....	ND	10.	µg/kg		D	
206-44-0	Fluoranthene.....	16.	10.	µg/kg		D	
129-00-0	Pyrene.....	17.	10.	µg/kg		D	
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg		D	
218-01-9	Chrysene.....	ND	10.	µg/kg		D	
205-99-2	Benzo[b]fluoranthene.....	ND	10.	µg/kg		D	
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		D	
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg		D	
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		D	
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		D	
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		D	
		Surrogate	Recovery		Limit		
		2-Fluorophenol	85. %		64. - 124.		
		Phenol-d6	87. %		30 - 159.		
		2,4,6-Tribromophenol	85. %		0 - 224.		
		1,2-Dichlorobenzene-d4	89. %		59. - 134.		
		Nitrobenzene-d5	93. %		42. - 142.		
		2-Fluorobiphenyl	89. %		57. - 135.		

Handwritten signature and date 10/11/99

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Contact: *Heather Brunelle*

McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-07</div> <div>Sediment</div> <div> <div>Sampled: 10/12/1999</div> <div>Extracted: 10/15/1999</div> <div>Analyzed: 10/21/1999 by PB</div> </div> <div>L13502-7</div> </div>						
91-20-3	Naphthalene	126.	100	µg/kg	10.	D
08-96-8	Acenaphthylene	ND	100	µg/kg	10.	D
3-32-9	Acenaphthene	5,700	100	µg/kg	10.	D
86-73-7	Fluorene	3,890	100	µg/kg	10.	D
7-86-5	Pentachlorophenol	ND	600	µg/kg	10.	D
5-01-8	Phenanthrene	8,950	100	µg/kg	10.	D
120-12-7	Anthracene	1,520	100	µg/kg	10.	D
06-44-0	Fluoranthene	4,950	100	µg/kg	10.	D
29-00-0	Pyrene	3,650	100	µg/kg	10.	D
56-55-3	Benzo[a]anthracene	1,080	100	µg/kg	10.	D
18-01-9	Chrysene	1,140	100	µg/kg	10.	D
05-99-2	Benzo[b]fluoranthene	717.	100	µg/kg	10.	D
207-08-9	Benzo[k]fluoranthene	311.	100	µg/kg	10.	D
0-32-8	Benzo[a]pyrene	387.	100	µg/kg	10.	D
93-39-5	Indeno[1,2,3-cd]pyrene	100.	100	µg/kg	10.	D
53-70-3	Dibenz[a,h]anthracene	ND	100	µg/kg	10.	D
91-24-2	Benzo[g,h,i]perylene	104.	100	µg/kg	10.	D
Surrogate		Recovery		Limit		
2-Fluorophenol		82. %		64. - 124.		
Phenol-d6		85. %		30 - 159.		
2,4,6-Tribromophenol		65. %		0 - 224.		
1,2-Dichlorobenzene-d4		92. %		59. - 134.		
Nitrobenzene-d5		97. %		42. - 142.		
2-Fluorobiphenyl		91. %		57. - 135.		

gck
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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
				Sampled: 10/13/1999		
				Extracted: 10/15/1999		
MBSE099-37	Sediment	Analyzed: 10/20/1999 by PB			L13502-8	
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	ND	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene.....	14.	10.	µg/kg		
129-00-0	Pyrene.....	17.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg		
218-01-9	Chrysene.....	11.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	20.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
Surrogate				Recovery	Limit	
2-Fluorophenol				95. %	64. - 124.	
Phenol-d6				97. %	30 - 159.	
2,4,6-Tribromophenol				96. %	0 - 224.	
1,2-Dichlorobenzene-d4				98. %	59. - 134.	
Nitrobenzene-d5				103. %	42. - 142.	
2-Fluorobiphenyl				99. %	57. - 135.	

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Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number					
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
<div> BSE099-50 Sediment <div> Sampled: 10/13/1999 Extracted: 10/15/1999 Analyzed: 10/20/1999 by PB </div> L13502-9 </div>							
91-20-3	Naphthalene.....	ND	10.	µg/kg			
08-96-8	Acenaphthylene.....	ND	10.	µg/kg			
3-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
7-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
5-01-8	Phenanthrene.....	55.	10.	µg/kg			
120-12-7	Anthracene.....	37.	10.	µg/kg			
06-44-0	Fluoranthene.....	57.	10.	µg/kg			
29-00-0	Pyrene.....	45.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	22.	10.	µg/kg			
18-01-9	Chrysene.....	36.	10.	µg/kg			
05-99-2	Benzo[b]fluoranthene.....	41.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	13.	10.	µg/kg			
0-32-8	Benzo[a]pyrene.....	13.	10.	µg/kg			
93-39-5	Indeno[1,2,3-cd]pyrene.....	11.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene.....	11.	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		95. %		64. - 124.			
Phenol-d6		97. %		30 - 159.			
2,4,6-Tribromophenol		96. %		0 - 224.			
1,2-Dichlorobenzene-d4		99. %		59. - 134.			
Nitrobenzene-d5		104. %		42. - 142.			
2-Fluorobiphenyl		100. %		57. - 135.			

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Contact: *Heather Brunelle*

Project: *000749.OA01.00.07.96*
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number					
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
				Sampled: 10/13/1999			
				Extracted: 10/15/1999			
BSE099-33	Sediment	Analyzed: 10/20/1999 by PB				L13502-11	
91-20-3	Naphthalene.....	ND	10.	µg/kg			
08-96-8	Acenaphthylene.....	ND	10.	µg/kg			
3-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
07-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
5-01-8	Phenanthrene.....	ND	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
06-44-0	Fluoranthene.....	19.	10.	µg/kg			
29-00-0	Pyrene.....	17.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg			
18-01-9	Chrysene.....	15.	10.	µg/kg			
05-99-2	Benzo[b]fluoranthene.....	38.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	12.	10.	µg/kg			
0-32-8	Benzo[a]pyrene.....	10.	10.	µg/kg			
93-39-5	Indeno[1,2,3-cd]pyrene.....	ND	12.	µg/kg		I2	
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene.....	ND	12.	µg/kg		I2	
Surrogate				Recovery	Limit		
2-Fluorophenol				91. %	64. - 124.		
Phenol-d6				94. %	30 - 159.		
2,4,6-Tribromophenol				96. %	0 - 224.		
1,2-Dichlorobenzene-d4				95. %	59. - 134.		
Nitrobenzene-d5				101. %	42. - 142.		
2-Fluorobiphenyl				97. %	57. - 135.		

Handwritten signature and date: 12/1/99

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSE099-28		Sediment		Sampled: 10/13/1999 Extracted: 10/15/1999 Analyzed: 10/20/1999 by PB				L13502-12
91-20-3	Naphthalene.....	ND	10.	µg/kg				
208-96-8	Acenaphthylene.....	ND	10.	µg/kg				
83-32-9	Acenaphthene.....	ND	10.	µg/kg				
86-73-7	Fluorene.....	ND	10.	µg/kg				
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg				
85-01-8	Phenanthrene.....	ND	10.	µg/kg				
120-12-7	Anthracene.....	ND	10.	µg/kg				
206-44-0	Fluoranthene	15.	10.	µg/kg				
129-00-0	Pyrene	14.	10.	µg/kg				
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg				
218-01-9	Chrysene	13.	10.	µg/kg				
205-99-2	Benzo[b]fluoranthene	31.	10.	µg/kg				
207-08-9	Benzo[k]fluoranthene	10.	10.	µg/kg				
50-32-8	Benzo[a]pyrene	11.	10.	µg/kg				
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg				
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg				
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg				
Surrogate		Recovery		Limit				
2-Fluorophenol		93. %		64. - 124.				
Phenol-d6		96. %		30 - 159.				
2,4,6-Tribromophenol		94. %		0 - 224.				
1,2-Dichlorobenzene-d4		98. %		59. - 134.				
Nitrobenzene-d5		103. %		42. - 142.				
2-Fluorobiphenyl		99. %		57. - 135.				

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
<div style="display: flex; justify-content: space-between;"> BSE099-08 Sediment Sampled: 10/13/1999 Extracted: 10/25/1999 Analyzed: 10/27/1999 by PB L13502-13 </div>							
91-20-3	Naphthalene	40,600	1,000	µg/kg	100.	D	
208-96-8	Acenaphthylene	ND	1,000	µg/kg	100.	D	
83-32-9	Acenaphthene	29,600	1,000	µg/kg	100.	D	
86-73-7	Fluorene	18,300	1,000	µg/kg	100.	D	
87-86-5	Pentachlorophenol	ND	6,000	µg/kg	100.	D	
85-01-8	Phenanthrene	36,200	1,000	µg/kg	100.	D	
120-12-7	Anthracene	5,700	1,000	µg/kg	100.	D	
206-44-0	Fluoranthene	16,700	1,000	µg/kg	100.	D	
129-00-0	Pyrene	11,200	1,000	µg/kg	100.	D	
56-55-3	Benzo[a]anthracene	2,640	1,000	µg/kg	100.	D	
118-01-9	Chrysene	2,460	1,000	µg/kg	100.	D	
205-99-2	Benzo[b]fluoranthene	1,200	1,000	µg/kg	100.	D	
207-08-9	Benzo[k]fluoranthene	ND	1,000	µg/kg	100.	D	
100-32-8	Benzo[a]pyrene	ND	1,000	µg/kg	100.	D	
193-39-5	Indeno[1,2,3-cd]pyrene	ND	1,000	µg/kg	100.	D	
53-70-3	Dibenz[a,h]anthracene	ND	1,000	µg/kg	100.	D	
191-24-2	Benzo[g,h,i]perylene	ND	1,000	µg/kg	100.	D	
		Surrogate	Recovery	Limit			
		2-Fluorophenol	78. %	64. - 124.			
		Phenol-d6	76. %	30 - 159.			
		2,4,6-Tribromophenol	72. %	0 - 224.			
		1,2-Dichlorobenzene-d4	89. %	59. - 134.			
		Nitrobenzene-d5	96. %	42. - 142.			
		2-Fluorobiphenyl	98. %	57. - 135.			

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McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix					Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

MBSE099-12		Sediment		Sampled: 10/13/1999 Extracted: 10/25/1999 Analyzed: 10/26/1999 by PB			L13502-14
91-20-3	Naphthalene	225.	10.	µg/kg			
208-96-8	Acenaphthylene	34.	10.	µg/kg			
83-32-9	Acenaphthene	6,290	1,000	µg/kg	100.	D	
86-73-7	Fluorene	3,850	1,000	µg/kg	100.	D	
87-86-5	Pentachlorophenol	ND	60.	µg/kg			
85-01-8	Phenanthrene	7,570	1,000	µg/kg	100.	D	
120-12-7	Anthracene	965.	100	µg/kg	100.	D	
206-44-0	Fluoranthene	3,190	1,000	µg/kg	100.	D	
129-00-0	Pyrene	2,190	1,000	µg/kg	100.	D	
56-55-3	Benzo[a]anthracene	539.	10.	µg/kg			
218-01-9	Chrysene	508.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene	281.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene	98.	10.	µg/kg			
50-32-8	Benzo[a]pyrene	176.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene	44.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene	16.	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene	46.	10.	µg/kg			
		Surrogate		Recovery		Limit	
		2-Fluorophenol		83. %		64. - 124.	
		Phenol-d6		84. %		30 - 159.	
		2,4,6-Tribromophenol		89. %		0 - 224.	
		1,2-Dichlorobenzene-d4		84. %		59. - 134.	
		Nitrobenzene-d5		95. %		42. - 142.	
		2-Fluorobiphenyl		85. %		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div> Sampled: 10/14/1999 Extracted: 10/25/1999 Analyzed: 10/27/1999 by PB </div> <div>L13502-16</div> </div>						
YBSE099-15	Sediment					
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	17.	10.	µg/kg		
86-73-7	Fluorene.....	17.	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	100	µg/kg		
85-01-8	Phenanthrene.....	80.	10.	µg/kg		
120-12-7	Anthracene.....	18.	10.	µg/kg		
206-44-0	Fluoranthene.....	124.	10.	µg/kg		
29-00-0	Pyrene.....	97.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	43.	10.	µg/kg		
18-01-9	Chrysene.....	55.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	50.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	20.	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	29.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene.....	14.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene.....	17.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		86. %		64. - 124.		
Phenol-d6		86. %		30 - 159.		
2,4,6-Tribromophenol		88. %		0 - 224.		
1,2-Dichlorobenzene-d4		86. %		59. - 134.		
Nitrobenzene-d5		88. %		42. - 142.		
2-Fluorobiphenyl		89. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
<div style="display: flex; justify-content: space-between;"> <div> MBSE099-16 Sediment </div> <div> Sampled: 10/14/1999 Extracted: 10/25/1999 Analyzed: 10/26/1999 by PB </div> <div> L13502-17 </div> </div>							
91-20-3	Naphthalene.....	42.	10.	µg/kg			
208-96-8	Acenaphthylene.....	14.	10.	µg/kg			
83-32-9	Acenaphthene.....	82.	10.	µg/kg			
86-73-7	Fluorene.....	75.	10.	µg/kg			
87-86-5	Pentachlorophenol.....	86.	60.	µg/kg			
85-01-8	Phenanthrene.....	388.	10.	µg/kg			
120-12-7	Anthracene.....	101.	10.	µg/kg			
206-44-0	Fluoranthene.....	1,260	100	µg/kg	10.	D	
129-00-0	Pyrene.....	927.	100	µg/kg	10.	D	
56-55-3	Benzo[a]anthracene.....	186.	10.	µg/kg			
218-01-9	Chrysene.....	601.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	361.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	140.	10.	µg/kg			
50-32-8	Benzo[a]pyrene.....	145.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	53.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	18.	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	51.	10.	µg/kg			
		Surrogate	Recovery	Limit			
		2-Fluorophenol	78. %	64. - 124.			
		Phenol-d6	80. %	30 - 159.			
		2,4,6-Tribromophenol	87. %	0 - 224.			
		1,2-Dichlorobenzene-d4	78. %	59. - 134.			
		Nitrobenzene-d5	83. %	42. - 142.			
		2-Fluorobiphenyl	83. %	57. - 135.			

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Project: **000749.0A01.00.07.96**

Contact: **Heather Brunelle**

McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-17</div> <div>Sediment</div> <div> <div>Sampled: 10/14/1999</div> <div>Extracted: 10/25/1999</div> <div>Analyzed: 10/27/1999 by PB</div> </div> <div>L13502-18</div> </div>						
91-20-3	Naphthalene	3,630	1,000	µg/kg	100.	D
208-96-8	Acenaphthylene	ND	1,000	µg/kg	100.	D
13-32-9	Acenaphthene	86,200	1,000	µg/kg	100.	D
86-73-7	Fluorene	56,400	1,000	µg/kg	100.	D
87-86-5	Pentachlorophenol	ND	6,000	µg/kg	100.	D
15-01-8	Phenanthrene	120,000	1,000	µg/kg	100.	D
120-12-7	Anthracene	16,600	1,000	µg/kg	100.	D
106-44-0	Fluoranthene	47,700	1,000	µg/kg	100.	D
129-00-0	Pyrene	32,200	1,000	µg/kg	100.	D
56-55-3	Benzo[a]anthracene	7,930	1,000	µg/kg	100.	D
118-01-9	Chrysene	7,240	1,000	µg/kg	100.	D
105-99-2	Benzo[b]fluoranthene	3,640	1,000	µg/kg	100.	D
207-08-9	Benzo[k]fluoranthene	1,540	1,000	µg/kg	100.	D
10-32-8	Benzo[a]pyrene	2,210	1,000	µg/kg	100.	D
193-39-5	Indeno[1,2,3-cd]pyrene	ND	1,000	µg/kg	100.	D
53-70-3	Dibenz[a,h]anthracene	ND	1,000	µg/kg	100.	D
191-24-2	Benzo[g,h,i]perylene	ND	1,000	µg/kg	100.	D
Surrogate		Recovery		Limit		
2-Fluorophenol		66. %		64. - 124.		
Phenol-d6		64. %		30 - 159.		
2,4,6-Tribromophenol		59. %		0 - 224.		
1,2-Dichlorobenzene-d4		69. %		59. - 134.		
Nitrobenzene-d5		99. %		42. - 142.		
2-Fluorobiphenyl		74. %		57. - 135.		

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Client: *Ecology & Environment, Inc.*
Contact: *Heather Brunelle*

Project: *000749.OA01.00.07.96*
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div> MBSE099-20 Sediment </div> <div> Sampled: 10/14/1999 Extracted: 10/25/1999 Analyzed: 10/26/1999 by PB </div> <div> L13502-19 </div> </div>						
91-20-3	Naphthalene.....	86.	10.	µg/kg		
208-96-8	Acenaphthylene.....	94.	10.	µg/kg		
83-32-9	Acenaphthene.....	2,350	100	µg/kg	10.	D
86-73-7	Fluorene.....	2,080	100	µg/kg	10.	D
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	8,240	100	µg/kg	10.	D
120-12-7	Anthracene.....	1,190	100	µg/kg	10.	D
206-44-0	Fluoranthene.....	9,340	100	µg/kg	10.	D
129-00-0	Pyrene.....	5,700	100	µg/kg	10.	D
56-55-3	Benzo[a]anthracene.....	1,330	100	µg/kg	10.	D
218-01-9	Chrysene.....	2,320	100	µg/kg	10.	D
205-99-2	Benzo[b]fluoranthene.....	1,440	100	µg/kg	10.	D
207-08-9	Benzo[k]fluoranthene.....	483.	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	570.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	134.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	58.	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	121.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		85. %		64. - 124.		
Phenol-d6		89. %		30 - 159.		
2,4,6-Tribromophenol		106. %		0 - 224.		
1,2-Dichlorobenzene-d4		90. %		59. - 134.		
Nitrobenzene-d5		96. %		42. - 142.		
2-Fluorobiphenyl		100. %		57. - 135.		

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McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number
CAS	Analyte	Result Reporting Limit Units (ppb) Dilution Comment

BSE099-21		Sediment		Sampled: 10/14/1999 Extracted: 10/25/1999 Analyzed: 10/26/1999 by PB		L13502-20
91-20-3	Naphthalene	54.	10.	µg/kg		
208-96-8	Acenaphthylene	13.	10.	µg/kg		
33-32-9	Acenaphthene	107.	10.	µg/kg		
86-73-7	Fluorene	91.	10.	µg/kg		
37-86-5	Pentachlorophenol	68.	60.	µg/kg		
35-01-8	Phenanthrene	190.	10.	µg/kg		
120-12-7	Anthracene	95.	10.	µg/kg		
206-44-0	Fluoranthene	383.	10.	µg/kg		
29-00-0	Pyrene	319.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	167.	10.	µg/kg		
18-01-9	Chrysene	249.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	243.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	95.	10.	µg/kg		
10-32-8	Benzo[a]pyrene	128.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene	40.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	13.	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	41.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		85. %		64. - 124.		
Phenol-d6		87. %		30 - 159.		
2,4,6-Tribromophenol		90. %		0 - 224.		
1,2-Dichlorobenzene-d4		79. %		59. - 134.		
Nitrobenzene-d5		87. %		42. - 142.		
2-Fluorobiphenyl		79. %		57. - 135.		

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

<i>Sample ID</i>	<i>Matrix</i>					<i>Lab Number</i>
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

		Sampled: 10/14/1999				
		Extracted: 10/25/1999				
		Analyzed: 10/26/1999 by PB				
MBSE099-23	Sediment					L13502-21
91-20-3	Naphthalene.....	18.	10.	µg/kg		
208-96-8	Acenaphthylene.....	19.	10.	µg/kg		
83-32-9	Acenaphthene.....	43.	10.	µg/kg		
86-73-7	Fluorene.....	49.	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	332.	10.	µg/kg		
120-12-7	Anthracene.....	343.	10.	µg/kg		
206-44-0	Fluoranthene.....	1,620	1,000	µg/kg	10.	D
129-00-0	Pyrene.....	1,320	1,000	µg/kg	10.	D
56-55-3	Benzo[a]anthracene.....	598.	10.	µg/kg		
218-01-9	Chrysene.....	657.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	467.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	163.	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	256.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	53.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	21.	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	48.	10.	µg/kg		
		Surrogate	Recovery	Limit		
		2-Fluorophenol	78. %	64. - 124.		
		Phenol-d6	79. %	30 - 159.		
		2,4,6-Tribromophenol	90. %	0 - 224.		
		1,2-Dichlorobenzene-d4	81. %	59. - 134.		
		Nitrobenzene-d5	85. %	42. - 142.		
		2-Fluorobiphenyl	84. %	57. - 135.		

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Contact: **Heather Brunelle**

McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-24</div> <div>Sediment</div> <div> <div>Sampled: 10/14/1999</div> <div>Extracted: 10/25/1999</div> <div>Analyzed: 10/26/1999 by PB</div> </div> <div>L13502-22</div> </div>						
91-20-3	Naphthalene	13.	10.	µg/kg		
08-96-8	Acenaphthylene	ND	10.	µg/kg		
3-32-9	Acenaphthene	14.	10.	µg/kg		
86-73-7	Fluorene	18.	10.	µg/kg		
7-86-5	Pentachlorophenol	ND	60.	µg/kg		
5-01-8	Phenanthrene	44.	10.	µg/kg		
120-12-7	Anthracene	42.	10.	µg/kg		
06-44-0	Fluoranthene	157.	10.	µg/kg		
29-00-0	Pyrene	130.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	93.	10.	µg/kg		
18-01-9	Chrysene	117.	10.	µg/kg		
05-99-2	Benzo[b]fluoranthene	103.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	40.	10.	µg/kg		
0-32-8	Benzo[a]pyrene	60.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene	16.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	16.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		90. %		64. - 124.		
Phenol-d6		91. %		30 - 159.		
2,4,6-Tribromophenol		101. %		0 - 224.		
1,2-Dichlorobenzene-d4		91. %		59. - 134.		
Nitrobenzene-d5		97. %		42. - 142.		
2-Fluorobiphenyl		93. %		57. - 135.		

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

		Sampled: 10/14/1999					
		Extracted: 10/25/1999					
		Analyzed: 10/26/1999 by PB					
MBSE099-25	Sediment						L13502-23
91-20-3	Naphthalene	20.	10.	µg/kg			
208-96-8	Acenaphthylene	ND	10.	µg/kg			
83-32-9	Acenaphthene	39.	10.	µg/kg			
86-73-7	Fluorene	36.	10.	µg/kg			
87-86-5	Pentachlorophenol	ND	60.	µg/kg			
85-01-8	Phenanthrene	60.	10.	µg/kg			
120-12-7	Anthracene	46.	10.	µg/kg			
206-44-0	Fluoranthene	144.	10.	µg/kg			
129-00-0	Pyrene	121.	10.	µg/kg			
56-55-3	Benzo[a]anthracene	82.	10.	µg/kg			
218-01-9	Chrysene	221.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene	235.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene	62.	10.	µg/kg			
50-32-8	Benzo[a]pyrene	102.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene	31.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene	14.	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene	30.	10.	µg/kg			
		Surrogate	Recovery		Limit		
		2-Fluorophenol	89. %		64. - 124.		
		Phenol-d6	90. %		30 - 159.		
		2,4,6-Tribromophenol	103. %		0 - 224.		
		1,2-Dichlorobenzene-d4	92. %		59. - 134.		
		Nitrobenzene-d5	97. %		42. - 142.		
		2-Fluorobiphenyl	98. %		57. - 135.		

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Client: **Ecology & Environment, Inc.**

Project: **000749.OA01.00.07.96**

Contact: **Heather Brunelle**

McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-51</div> <div>Sediment</div> <div> <div>Sampled: 10/14/1999</div> <div>Extracted: 10/25/1999</div> <div>Analyzed: 10/26/1999 by PB</div> </div> <div>L13502-24</div> </div>						
91-20-3	Naphthalene	75.	10.	µg/kg		
08-96-8	Acenaphthylene	16.	10.	µg/kg		
3-32-9	Acenaphthene	131.	10.	µg/kg		
86-73-7	Fluorene	97.	10.	µg/kg		
7-86-5	Pentachlorophenol	96.	60.	µg/kg		
5-01-8	Phenanthrene	213.	10.	µg/kg		
120-12-7	Anthracene	141.	10.	µg/kg		
06-44-0	Fluoranthene	603.	10.	µg/kg		
29-00-0	Pyrene	477.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	254.	10.	µg/kg		
18-01-9	Chrysene	409.	10.	µg/kg		
05-99-2	Benzo[b]fluoranthene	358.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	111.	10.	µg/kg		
0-32-8	Benzo[a]pyrene	173.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene	46.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	18.	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	45.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		85. %		64. - 124.		
Phenol-d6		86. %		30 - 159.		
2,4,6-Tribromophenol		101. %		0 - 224.		
1,2-Dichlorobenzene-d4		87. %		59. - 134.		
Nitrobenzene-d5		92. %		42. - 142.		
2-Fluorobiphenyl		95. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>MBSE099-26</div> <div>Sediment</div> <div> <div>Sampled: 10/14/1999</div> <div>Extracted: 10/25/1999</div> <div>Analyzed: 10/26/1999 by PB</div> </div> <div>L13502-25</div> </div>						
91-20-3	Naphthalene	ND	10.	µg/kg		
208-96-8	Acenaphthylene	ND	10.	µg/kg		
83-32-9	Acenaphthene	ND	10.	µg/kg		
86-73-7	Fluorene	ND	10.	µg/kg		
87-86-5	Pentachlorophenol	ND	60.	µg/kg		
85-01-8	Phenanthrene	21.	10.	µg/kg		
120-12-7	Anthracene	10.	10.	µg/kg		
206-44-0	Fluoranthene	41.	10.	µg/kg		
129-00-0	Pyrene	37.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	20.	10.	µg/kg		
218-01-9	Chrysene	24.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	30.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	12.	10.	µg/kg		
50-32-8	Benzo[a]pyrene	21.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene	ND	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		92. %		64. - 124.		
Phenol-d6		94. %		30 - 159.		
2,4,6-Tribromophenol		106. %		0 - 224.		
1,2-Dichlorobenzene-d4		91. %		59. - 134.		
Nitrobenzene-d5		98. %		42. - 142.		
2-Fluorobiphenyl		96. %		57. - 135.		

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Project: *000749.OA01.00.07.96*
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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
BSE099-27 Sediment Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB							L13502-26
91-20-3	Naphthalene.....	61.	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
13-32-9	Acenaphthene.....	37.	10.	µg/kg			
86-73-7	Fluorene.....	60.	10.	µg/kg			
137-86-5	Pentachlorophenol.....	ND	100	µg/kg			
15-01-8	Phenanthrene.....	86.	10.	µg/kg			
120-12-7	Anthracene.....	65.	10.	µg/kg			
106-44-0	Fluoranthene.....	291.	10.	µg/kg			
129-00-0	Pyrene.....	260.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	112.	10.	µg/kg			
118-01-9	Chrysene.....	144.	10.	µg/kg			
1205-99-2	Benzo[b]fluoranthene.....	128.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	50.	10.	µg/kg			
10-32-8	Benzo[a]pyrene.....	68.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	30.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	10.	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	35.	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		65. %		64. - 124.			
Phenol-d6		71. %		30 - 159.			
2,4,6-Tribromophenol		84. %		0 - 224.			
1,2-Dichlorobenzene-d4		66. %		59. - 134.			
Nitrobenzene-d5		71. %		42. - 142.			
2-Fluorobiphenyl		79. %		57. - 135.			

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L13502

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Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
MBSE099-29		Sediment				
		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB				
		L13502-27				
91-20-3	Naphthalene	55.	10.	µg/kg		
208-96-8	Acenaphthylene	14.	10.	µg/kg		
83-32-9	Acenaphthene	112.	10.	µg/kg		
86-73-7	Fluorene	107.	10.	µg/kg		
87-86-5	Pentachlorophenol	ND	60.	µg/kg		
85-01-8	Phenanthrene	333.	10.	µg/kg		
120-12-7	Anthracene	177.	10.	µg/kg		
206-44-0	Fluoranthene	798.	10.	µg/kg		
129-00-0	Pyrene	626.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	441.	10.	µg/kg		
218-01-9	Chrysene	707.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	511.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	146.	10.	µg/kg		
50-32-8	Benzo[a]pyrene	256.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	88.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	37.	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene	94.	10.	µg/kg		
		Surrogate	Recovery	Limit		
		2-Fluorophenol	74. %	64. - 124.		
		Phenol-d6	77. %	30 - 159.		
		2,4,6-Tribromophenol	95. %	0 - 224.		
		1,2-Dichlorobenzene-d4	74. %	59. - 134.		
		Nitrobenzene-d5	80. %	42. - 142.		
		2-Fluorobiphenyl	85. %	57. - 135.		

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.0A01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-30</div> <div>Sediment</div> <div> <div>Sampled: 10/15/1999</div> <div>Extracted: 10/26/1999</div> <div>Analyzed: 10/27/1999 by PB</div> </div> <div>L13502-28</div> </div>						
91-20-3	Naphthalene	10.	10.	µg/kg		
208-96-8	Acenaphthylene	ND	10.	µg/kg		
33-32-9	Acenaphthene	ND	10.	µg/kg		
86-73-7	Fluorene	11.	10.	µg/kg		
37-86-5	Pentachlorophenol	ND	60.	µg/kg		
35-01-8	Phenanthrene	35.	10.	µg/kg		
120-12-7	Anthracene	12.	10.	µg/kg		
206-44-0	Fluoranthene	71.	10.	µg/kg		
29-00-0	Pyrene	68.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	32.	10.	µg/kg		
218-01-9	Chrysene	45.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	46.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	17.	10.	µg/kg		
20-32-8	Benzo[a]pyrene	32.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	16.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	20.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		70. %		64. - 124.		
Phenol-d6		73. %		30 - 159.		
2,4,6-Tribromophenol		86. %		0 - 224.		
1,2-Dichlorobenzene-d4		69. %		59. - 134.		
Nitrobenzene-d5		77. %		42. - 142.		
2-Fluorobiphenyl		80. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						
<div> <div> MBSE099-31 Sediment </div> <div> Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB </div> <div>L13502-29</div> </div>							
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene	12.	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene	19.	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene	41.	10.	µg/kg			
129-00-0	Pyrene	41.	10.	µg/kg			
56-55-3	Benzo[a]anthracene	18.	10.	µg/kg			
218-01-9	Chrysene	22.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene	26.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg			
50-32-8	Benzo[a]pyrene	19.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene	12.	10.	µg/kg			
	Surrogate			Recovery		Limit	
	2-Fluorophenol			71.%		64. - 124.	
	Phenol-d6			73.%		30 - 159.	
	2,4,6-Tribromophenol			86.%		0 - 224.	
	1,2-Dichlorobenzene-d4			72.%		59. - 134.	
	Nitrobenzene-d5			78.%		42. - 142.	
	2-Fluorobiphenyl			81.%		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<p>Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB</p>						
BSE099-52	Sediment	L13502-30				
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	14.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene.....	28.	10.	µg/kg		
29-00-0	Pyrene.....	26.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	12.	10.	µg/kg		
218-01-9	Chrysene.....	15.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	16.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
60-32-8	Benzo[a]pyrene.....	11.	10.	µg/kg		
93-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		71. %		64. - 124.		
Phenol-d6		74. %		30 - 159.		
2,4,6-Tribromophenol		88. %		0 - 224.		
1,2-Dichlorobenzene-d4		75. %		59. - 134.		
Nitrobenzene-d5		80. %		42. - 142.		
2-Fluorobiphenyl		83. %		57. - 135.		

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McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSE099-32		Sediment		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB				L13502-31
91-20-3	Naphthalene	13.	10.	µg/kg				
208-96-8	Acenaphthylene	ND	10.	µg/kg				
83-32-9	Acenaphthene	ND	10.	µg/kg				
86-73-7	Fluorene	13.	10.	µg/kg				
87-86-5	Pentachlorophenol	ND	60.	µg/kg				
85-01-8	Phenanthrene	28.	10.	µg/kg				
120-12-7	Anthracene	16.	10.	µg/kg				
206-44-0	Fluoranthene	93.	10.	µg/kg				
129-00-0	Pyrene	89.	10.	µg/kg				
56-55-3	Benzo[a]anthracene	37.	10.	µg/kg				
218-01-9	Chrysene	46.	10.	µg/kg				
205-99-2	Benzo[b]fluoranthene	50.	10.	µg/kg				
207-08-9	Benzo[k]fluoranthene	18.	10.	µg/kg				
50-32-8	Benzo[a]pyrene	32.	10.	µg/kg				
193-39-5	Indeno[1,2,3-cd]pyrene	14.	10.	µg/kg				
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg				
191-24-2	Benzo[g,h,i]perylene	17.	10.	µg/kg				
		Surrogate	Recovery	Limit				
		2-Fluorophenol	72. %	64. - 124.				
		Phenol-d6	75. %	30 - 159.				
		2,4,6-Tribromophenol	87. %	0 - 224.				
		1,2-Dichlorobenzene-d4	76. %	59. - 134.				
		Nitrobenzene-d5	80. %	42. - 142.				
		2-Fluorobiphenyl	84. %	57. - 135.				

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
BSE099-34		Sediment				
		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB				
		L13502-32				
91-20-3	Naphthalene	20.	10.	µg/kg		
208-96-8	Acenaphthylene	ND	10.	µg/kg		
83-32-9	Acenaphthene	ND	10.	µg/kg		
86-73-7	Fluorene	22.	10.	µg/kg		
87-86-5	Pentachlorophenol	ND	60.	µg/kg		
85-01-8	Phenanthrene	81.	10.	µg/kg		
120-12-7	Anthracene	29.	10.	µg/kg		
206-44-0	Fluoranthene	452.	10.	µg/kg		
29-00-0	Pyrene	361.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	73.	10.	µg/kg		
218-01-9	Chrysene	147.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	112.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	37.	10.	µg/kg		
20-32-8	Benzo[a]pyrene	49.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	20.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	22.	10.	µg/kg		
		Surrogate	Recovery	Limit		
		2-Fluorophenol	72. %	64. - 124.		
		Phenol-d6	74. %	30 - 159.		
		2,4,6-Tribromophenol	87. %	0 - 224.		
		1,2-Dichlorobenzene-d4	74. %	59. - 134.		
		Nitrobenzene-d5	80. %	42. - 142.		
		2-Fluorobiphenyl	84. %	57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

MBSE099-39	Sediment	Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB					L13502-34
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91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene	19.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene	35.	10.	µg/kg		
129-00-0	Pyrene	33.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	19.	10.	µg/kg		
218-01-9	Chrysene	24.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	33.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	11.	10.	µg/kg		
50-32-8	Benzo[a]pyrene	25.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	11.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	13.	10.	µg/kg		

Surrogate	Recovery	Limit
2-Fluorophenol	78. %	64. - 124.
Phenol-d6	79. %	30 - 159.
2,4,6-Tribromophenol	89. %	0 - 224.
1,2-Dichlorobenzene-d4	78. %	59. - 134.
Nitrobenzene-d5	84. %	42. - 142.
2-Fluorobiphenyl	86. %	57. - 135.

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L13502

Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA)
by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
MBSE099-36		Sediment				
		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB				
		L13502-35				
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	ND	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene.....	ND	10.	µg/kg		
129-00-0	Pyrene.....	ND	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg		
218-01-9	Chrysene.....	ND	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	ND	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
		Surrogate	Recovery	Limit		
		2-Fluorophenol	83.%	64. - 124.		
		Phenol-d6	83.%	30 - 159.		
		2,4,6-Tribromophenol	96.%	0 - 224.		
		1,2-Dichlorobenzene-d4	84.%	59. - 134.		
		Nitrobenzene-d5	90.%	42. - 142.		
		2-Fluorobiphenyl	93.%	57. - 135.		

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Project: **000749.0A01.00.07.96**
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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

MBSE099-19		Sediment		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB			L13502-36
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene.....	80.	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene.....	153.	10.	µg/kg			
129-00-0	Pyrene.....	107.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	32.	10.	µg/kg			
218-01-9	Chrysene.....	47.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	41.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	13.	10.	µg/kg			
50-32-8	Benzo[a]pyrene.....	23.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		81. %		64. - 124.			
Phenol-d6		84. %		30 - 159.			
2,4,6-Tribromophenol		94. %		0 - 224.			
1,2-Dichlorobenzene-d4		84. %		59. - 134.			
Nitrobenzene-d5		88. %		42. - 142.			
2-Fluorobiphenyl		93. %		57. - 135.			

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
MBSE099-38		Sediment				
		Sampled: 10/15/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB				
		L13502-37				
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene	17.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene	44.	10.	µg/kg		
129-00-0	Pyrene	38.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	15.	10.	µg/kg		
218-01-9	Chrysene	26.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	28.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	11.	10.	µg/kg		
50-32-8	Benzo[a]pyrene	16.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
		Surrogate	Recovery		Limit	
		2-Fluorophenol	86. %		64. - 124.	
		Phenol-d6	87. %		30 - 159.	
		2,4,6-Tribromophenol	90. %		0 - 224.	
		1,2-Dichlorobenzene-d4	81. %		59. - 134.	
		Nitrobenzene-d5	89. %		42. - 142.	
		2-Fluorobiphenyl	85. %		57. - 135.	

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
BSE099-18 Sediment							L13502-38
Sampled: 10/16/1999 Extracted: 10/26/1999 Analyzed: 10/27/1999 by PB							
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
33-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
37-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
35-01-8	Phenanthrene.....	ND	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene.....	23.	10.	µg/kg			
129-00-0	Pyrene.....	22.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	17.	10.	µg/kg			
218-01-9	Chrysene.....	23.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	33.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	12.	10.	µg/kg			
50-32-8	Benzo[a]pyrene.....	14.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		83. %		64. - 124.			
Phenol-d6		84. %		30 - 159.			
2,4,6-Tribromophenol		94. %		0 - 224.			
1,2-Dichlorobenzene-d4		90. %		59. - 134.			
Nitrobenzene-d5		91. %		42. - 142.			
2-Fluorobiphenyl		94. %		57. - 135.			

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Client: **Ecology & Environment, Inc.**
 Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSE099-10		Sediment		Sampled: 10/16/1999 Extracted: 10/27/1999 Analyzed: 10/29/1999 by PB				L13502-39
91-20-3	Naphthalene	58.	10.	µg/kg				
208-96-8	Acenaphthylene	ND	10.	µg/kg				
83-32-9	Acenaphthene	240.	10.	µg/kg				
86-73-7	Fluorene	62.	10.	µg/kg				
87-86-5	Pentachlorophenol	ND	60.	µg/kg				
85-01-8	Phenanthrene	33.	10.	µg/kg				
120-12-7	Anthracene	25.	10.	µg/kg				
206-44-0	Fluoranthene	268.	10.	µg/kg				
129-00-0	Pyrene	289.	10.	µg/kg				
56-55-3	Benzo[a]anthracene	109.	10.	µg/kg				
218-01-9	Chrysene	105.	10.	µg/kg				
205-99-2	Benzo[b]fluoranthene	80.	10.	µg/kg				
207-08-9	Benzo[k]fluoranthene	30.	10.	µg/kg				
50-32-8	Benzo[a]pyrene	45.	10.	µg/kg				
193-39-5	Indeno[1,2,3-cd]pyrene	22.	10.	µg/kg				
53-70-3	Dibenz[a,h]anthracene	ND	10.	µg/kg				
191-24-2	Benzo[g,h,i]perylene	29.	10.	µg/kg				
		Surrogate	Recovery	Limit				
		2-Fluorophenol	91. %	64. - 124.				
		Phenol-d6	91. %	30 - 159.				
		2,4,6-Tribromophenol	102. %	0 - 224.				
		1,2-Dichlorobenzene-d4	90. %	59. - 134.				
		Nitrobenzene-d5	90. %	42. - 142.				
		2-Fluorobiphenyl	91. %	57. - 135.				

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>BSE099-13</div> <div>Sediment</div> <div> <div>Sampled: 10/18/1999</div> <div>Extracted: 10/27/1999</div> <div>Analyzed: 10/29/1999 by PB</div> </div> <div>L13502-40</div> </div>						
91-20-3	Naphthalene.....	30.	10.	µg/kg		
208-96-8	Acenaphthylene.....	23.	10.	µg/kg		
33-32-9	Acenaphthene.....	88.	10.	µg/kg		
86-73-7	Fluorene.....	42.	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	231.	10.	µg/kg		
120-12-7	Anthracene.....	126.	10.	µg/kg		
206-44-0	Fluoranthene.....	276.	10.	µg/kg		
29-00-0	Pyrene.....	375.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	162.	10.	µg/kg		
218-01-9	Chrysene.....	161.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	136.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	52.	10.	µg/kg		
20-32-8	Benzo[a]pyrene.....	153.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	68.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	17.	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	84.	10.	µg/kg		
	Surrogate		Recovery		Limit	
	2-Fluorophenol		94. %		64. - 124.	
	Phenol-d6		95. %		30 - 159.	
	2,4,6-Tribromophenol		114. %		0 - 224.	
	1,2-Dichlorobenzene-d4		93. %		59. - 134.	
	Nitrobenzene-d5		99. %		42. - 142.	
	2-Fluorobiphenyl		95. %		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix					Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div> MBSE099-53 Sediment </div> <div> Sampled: 10/18/1999 Extracted: 10/27/1999 Analyzed: 10/29/1999 by PB </div> <div>L13502-41</div> </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	ND	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene	12.	10.	µg/kg		
129-00-0	Pyrene	11.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg		
218-01-9	Chrysene.....	ND	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	13.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
	Surrogate		Recovery		Limit	
	2-Fluorophenol		82. %		64. - 124.	
	Phenol-d6		84. %		30 - 159.	
	2,4,6-Tribromophenol		97. %		0 - 224.	
	1,2-Dichlorobenzene-d4		83. %		59. - 134.	
	Nitrobenzene-d5		88. %		42. - 142.	
	2-Fluorobiphenyl		85. %		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
BSE099-11 Sediment							L13502-42
Sampled: 10/18/1999 Extracted: 10/27/1999 Analyzed: 10/29/1999 by PB							
91-20-3	Naphthalene.....	ND	10.	µg/kg			
108-96-8	Acenaphthylene.....	ND	10.	µg/kg			
13-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
17-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
15-01-8	Phenanthrene.....	11.	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
106-44-0	Fluoranthene.....	39.	10.	µg/kg			
129-00-0	Pyrene.....	45.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	18.	10.	µg/kg			
118-01-9	Chrysene.....	25.	10.	µg/kg			
1205-99-2	Benzo[b]fluoranthene.....	26.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg			
10-32-8	Benzo[a]pyrene.....	18.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	12.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	17.	10.	µg/kg			
				Surrogate	Recovery	Limit	
				2-Fluorophenol	90. %	64. - 124.	
				Phenol-d6	93. %	30 - 159.	
				2,4,6-Tribromophenol	105. %	0 - 224.	
				1,2-Dichlorobenzene-d4	94. %	59. - 134.	
				Nitrobenzene-d5	99. %	42. - 142.	
				2-Fluorobiphenyl	96. %	57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div style="display: flex; justify-content: space-between;"> MBSE099-09 Sediment Sampled: 10/18/1999 Extracted: 10/27/1999 Analyzed: 10/29/1999 by PB L13502-43 </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	ND	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene	16.	10.	µg/kg		
129-00-0	Pyrene	14.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg		
218-01-9	Chrysene	12.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	15.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
		Surrogate	Recovery	Limit		
		2-Fluorophenol	85. %	64. - 124.		
		Phenol-d6	87. %	30 - 159.		
		2,4,6-Tribromophenol	97. %	0 - 224.		
		1,2-Dichlorobenzene-d4	88. %	59. - 134.		
		Nitrobenzene-d5	91. %	42. - 142.		
		2-Fluorobiphenyl	88. %	57. - 135.		

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Project: *000749.0A01.00.07.96*

Contact: *Heather Brunelle*

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div> BSE099-14 <i>Sediment</i> </div> <div> Sampled: 10/18/1999 Extracted: 10/27/1999 Analyzed: 10/29/1999 by PB </div> <div> L13502-44 </div> </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene	35.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene	53.	10.	µg/kg		
29-00-0	Pyrene	63.	10.	µg/kg		
56-55-3	Benzo[a]anthracene	31.	10.	µg/kg		
218-01-9	Chrysene	33.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene	35.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene	15.	10.	µg/kg		
20-32-8	Benzo[a]pyrene	33.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene	17.	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
91-24-2	Benzo[g,h,i]perylene	22.	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		89. %		64. - 124.		
Phenol-d6		92. %		30 - 159.		
2,4,6-Tribromophenol		100. %		0 - 224.		
1,2-Dichlorobenzene-d4		95. %		59. - 134.		
Nitrobenzene-d5		100. %		42. - 142.		
2-Fluorobiphenyl		96. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
				Sampled: 10/19/1999			
				Extracted: 10/27/1999			
MBSE099-43	Sediment	Analyzed: 10/29/1999 by PB					L13502-52
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene.....	ND	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene.....	ND	10.	µg/kg			
129-00-0	Pyrene.....	ND	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg			
218-01-9	Chrysene.....	ND	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	ND	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg			
50-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg			
				Surrogate	Recovery	Limit	
				2-Fluorophenol	86. %	64. - 124.	
				Phenol-d6	89. %	30 - 159.	
				2,4,6-Tribromophenol	105. %	0 - 224.	
				1,2-Dichlorobenzene-d4	81. %	59. - 134.	
				Nitrobenzene-d5	91. %	42. - 142.	
				2-Fluorobiphenyl	86. %	57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div> <div>MBSE099-54</div> <div>Sediment</div> <div> <div>Sampled: 10/19/1999</div> <div>Extracted: 10/27/1999</div> <div>Analyzed: 10/30/1999 by PB</div> </div> <div>L13502-53</div> </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	11.	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene.....	26.	10.	µg/kg		
129-00-0	Pyrene.....	26.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	13.	10.	µg/kg		
218-01-9	Chrysene.....	14.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	17.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	12.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
	Surrogate		Recovery		Limit	
	2-Fluorophenol		77. %		64. - 124.	
	Phenol-d6		78. %		30 - 159.	
	2,4,6-Tribromophenol		95. %		0 - 224.	
	1,2-Dichlorobenzene-d4		74. %		59. - 134.	
	Nitrobenzene-d5		83. %		42. - 142.	
	2-Fluorobiphenyl		79. %		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<div style="display: flex; justify-content: space-between;"> MBSE099-40 Sediment Sampled: 10/19/1999 Extracted: 10/27/1999 Analyzed: 10/30/1999 by PB L13502-54 </div>						
91-20-3	Naphthalene.....	ND	10.	µg/kg		
208-96-8	Acenaphthylene.....	ND	10.	µg/kg		
83-32-9	Acenaphthene.....	ND	10.	µg/kg		
86-73-7	Fluorene.....	ND	10.	µg/kg		
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg		
85-01-8	Phenanthrene.....	ND	10.	µg/kg		
120-12-7	Anthracene.....	ND	10.	µg/kg		
206-44-0	Fluoranthene.....	19.	10.	µg/kg		
129-00-0	Pyrene.....	19.	10.	µg/kg		
56-55-3	Benzo[a]anthracene.....	11.	10.	µg/kg		
218-01-9	Chrysene.....	15.	10.	µg/kg		
205-99-2	Benzo[b]fluoranthene.....	15.	10.	µg/kg		
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg		
50-32-8	Benzo[a]pyrene.....	12.	10.	µg/kg		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg		
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg		
191-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg		
Surrogate		Recovery		Limit		
2-Fluorophenol		93. %		64. - 124.		
Phenol-d6		95. %		30 - 159.		
2,4,6-Tribromophenol		114. %		0 - 224.		
1,2-Dichlorobenzene-d4		88. %		59. - 134.		
Nitrobenzene-d5		100. %		42. - 142.		
2-Fluorobiphenyl		90. %		57. - 135.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix					Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment

BSE099-41		Sediment		Sampled: 10/19/1999 Extracted: 10/27/1999 Analyzed: 10/30/1999 by PB			L13502-55
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene.....	ND	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene.....	ND	10.	µg/kg			
129-00-0	Pyrene.....	ND	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	ND	10.	µg/kg			
218-01-9	Chrysene.....	ND	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	ND	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	ND	10.	µg/kg			
60-32-8	Benzo[a]pyrene.....	ND	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
91-24-2	Benzo[g,h,i]perylene.....	ND	10.	µg/kg			
Surrogate		Recovery		Limit			
2-Fluorophenol		93. %		64. - 124.			
Phenol-d6		96. %		30 - 159.			
2,4,6-Tribromophenol		114. %		0 - 224.			
1,2-Dichlorobenzene-d4		90. %		59. - 134.			
Nitrobenzene-d5		100. %		42. - 142.			
2-Fluorobiphenyl		94. %		57. - 135.			

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Client: **Ecology & Environment, Inc.**
Contact: **Heather Brunelle**

Project: **000749.OA01.00.07.96**
McCormick & Baxter

Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						
<p>Sampled: 10/19/1999 Extracted: 10/27/1999 Analyzed: 10/30/1999 by PB</p>							L13502-56
MBSE099-42	Sediment						
91-20-3	Naphthalene.....	ND	10.	µg/kg			
208-96-8	Acenaphthylene.....	ND	10.	µg/kg			
83-32-9	Acenaphthene.....	ND	10.	µg/kg			
86-73-7	Fluorene.....	ND	10.	µg/kg			
87-86-5	Pentachlorophenol.....	ND	60.	µg/kg			
85-01-8	Phenanthrene.....	71.	10.	µg/kg			
120-12-7	Anthracene.....	ND	10.	µg/kg			
206-44-0	Fluoranthene.....	75.	10.	µg/kg			
129-00-0	Pyrene.....	75.	10.	µg/kg			
56-55-3	Benzo[a]anthracene.....	20.	10.	µg/kg			
218-01-9	Chrysene.....	32.	10.	µg/kg			
205-99-2	Benzo[b]fluoranthene.....	32.	10.	µg/kg			
207-08-9	Benzo[k]fluoranthene.....	11.	10.	µg/kg			
50-32-8	Benzo[a]pyrene.....	28.	10.	µg/kg			
193-39-5	Indeno[1,2,3-cd]pyrene.....	14.	10.	µg/kg			
53-70-3	Dibenz[a,h]anthracene.....	ND	10.	µg/kg			
191-24-2	Benzo[g,h,i]perylene.....	18.	10.	µg/kg			
	Surrogate			Recovery		Limit	
	2-Fluorophenol			69. %		64. - 124.	
	Phenol-d6			73. %		30 - 159.	
	2,4,6-Tribromophenol			97. %		0 - 224.	
	1,2-Dichlorobenzene-d4			69. %		59. - 134.	
	Nitrobenzene-d5			77. %		42. - 142.	
	2-Fluorobiphenyl			73. %		57. - 135.	

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
Sampled: 10/13/1999 Extracted: 10/18/1999 Analyzed: 10/20/1999 by PB							L13502-15
BSE099-06	Water						
91-20-3	Naphthalene.....	0.5	0.1	µg/L			
208-96-8	Acenaphthylene.....	ND	0.1	µg/L			
83-32-9	Acenaphthene.....	0.4	0.1	µg/L			
86-73-7	Fluorene.....	0.3	0.1	µg/L			
87-86-5	Pentachlorophenol.....	ND	1.0	µg/L			
85-01-8	Phenanthrene.....	0.6	0.1	µg/L			
120-12-7	Anthracene.....	ND	0.1	µg/L			
206-44-0	Fluoranthene.....	0.2	0.1	µg/L			
129-00-0	Pyrene.....	0.2	0.1	µg/L			
56-55-3	Benzo[a]anthracene.....	ND	0.1	µg/L			
218-01-9	Chrysene.....	ND	0.1	µg/L			
205-99-2	Benzo[b]fluoranthene.....	ND	0.1	µg/L			
207-08-9	Benzo[k]fluoranthene.....	ND	0.1	µg/L			
50-32-8	Benzo[a]pyrene.....	ND	0.1	µg/L			
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	0.1	µg/L			
53-70-3	Dibenz[a,h]anthracene.....	ND	0.1	µg/L			
91-24-2	Benzo[g,h,i]perylene.....	ND	0.1	µg/L			
Surrogate		Recovery		Limit			
2-Fluorophenol		61. %		0 - 141.		11	
Phenol-d6		39. %		0 - 120			
2,4,6-Tribromophenol		96. %		0 - 279.			
1,2-Dichlorobenzene-d4		94. %		49. - 127.			
Nitrobenzene-d5		102. %		0 - 183.			
2-Fluorobiphenyl		96. %		57. - 131.			

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSW99-01		Water		Sampled: 10/18/1999 Extracted: 10/22/1999 Analyzed: 10/25/1999 by PB			L13502-45
91-20-3	Naphthalene	0.5	0.1	µg/L			
208-96-8	Acenaphthylene	ND	0.1	µg/L			
83-32-9	Acenaphthene	0.4	0.1	µg/L			
86-73-7	Fluorene	0.3	0.1	µg/L			
87-86-5	Pentachlorophenol	ND	1.0	µg/L			
85-01-8	Phenanthrene	0.5	0.1	µg/L			
120-12-7	Anthracene	ND	0.1	µg/L			
206-44-0	Fluoranthene	0.2	0.1	µg/L			
129-00-0	Pyrene	0.1	0.1	µg/L			
56-55-3	Benzo[a]anthracene	ND	0.1	µg/L			
218-01-9	Chrysene	ND	0.1	µg/L			
205-99-2	Benzo[b]fluoranthene	ND	0.1	µg/L			
207-08-9	Benzo[k]fluoranthene	ND	0.1	µg/L			
50-32-8	Benzo[a]pyrene	ND	0.1	µg/L			
193-39-5	Indeno[1,2,3-cd]pyrene	ND	0.1	µg/L			
53-70-3	Dibenz[a,h]anthracene	ND	0.1	µg/L			
191-24-2	Benzo[g,h,i]perylene	ND	0.1	µg/L			
Surrogate		Recovery		Limit			
2-Fluorophenol		55. %		0 - 141.			
Phenol-d6		36. %		0 - 120			
2,4,6-Tribromophenol		87. %		0 - 279.			
1,2-Dichlorobenzene-d4		81. %		49. - 127.			
Nitrobenzene-d5		96. %		0 - 183.			
2-Fluorobiphenyl		90. %		57. - 131.			

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
<div style="display: flex; justify-content: space-between;"> BSW99-02 Water Sampled: 10/18/1999 Extracted: 10/22/1999 Analyzed: 10/25/1999 by PB L13502-46 </div>							
91-20-3	Naphthalene	0.3	0.1	µg/L			
208-96-8	Acenaphthylene	ND	0.1	µg/L			
83-32-9	Acenaphthene	ND	0.1	µg/L			
86-73-7	Fluorene	ND	0.1	µg/L			
87-86-5	Pentachlorophenol	ND	1.0	µg/L			
85-01-8	Phenanthrene	ND	0.1	µg/L			
120-12-7	Anthracene	ND	0.1	µg/L			
206-44-0	Fluoranthene	ND	0.1	µg/L			
29-00-0	Pyrene	ND	0.1	µg/L			
56-55-3	Benzo[a]anthracene	ND	0.1	µg/L			
218-01-9	Chrysene	ND	0.1	µg/L			
205-99-2	Benzo[b]fluoranthene	ND	0.1	µg/L			
207-08-9	Benzo[k]fluoranthene	ND	0.1	µg/L			
60-32-8	Benzo[a]pyrene	ND	0.1	µg/L			
93-39-5	Indeno[1,2,3-cd]pyrene	ND	0.1	µg/L			
53-70-3	Dibenz[a,h]anthracene	ND	0.1	µg/L			
91-24-2	Benzo[g,h,i]perylene	ND	0.1	µg/L			
		Surrogate	Recovery		Limit		
		2-Fluorophenol	56. %		0 - 141.		
		Phenol-d6	36. %		0 - 120		
		2,4,6-Tribromophenol	85. %		0 - 279.		
		1,2-Dichlorobenzene-d4	82. %		49. - 127.		
		Nitrobenzene-d5	97. %		0 - 183.		
		2-Fluorobiphenyl	92. %		57. - 131.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Result	Reporting Limit	Units (ppb)	Dilution	Comment	Lab Number
CAS	Analyte						

MBSW99-03		Water		Sampled: 10/18/1999 Extracted: 10/22/1999 Analyzed: 10/25/1999 by PB			L13502-47
91-20-3	Naphthalene	0.2	0.1	µg/L			
208-96-8	Acenaphthylene	ND	0.1	µg/L			
83-32-9	Acenaphthene	0.8	0.1	µg/L			
86-73-7	Fluorene	0.5	0.1	µg/L			
87-86-5	Pentachlorophenol	ND	1.0	µg/L			
85-01-8	Phenanthrene	0.4	0.1	µg/L			
120-12-7	Anthracene	ND	0.1	µg/L			
206-44-0	Fluoranthene	0.3	0.1	µg/L			
129-00-0	Pyrene	0.1	0.1	µg/L			
56-55-3	Benzo[a]anthracene	ND	0.1	µg/L			
218-01-9	Chrysene	ND	0.1	µg/L			
205-99-2	Benzo[b]fluoranthene	ND	0.1	µg/L			
207-08-9	Benzo[k]fluoranthene	ND	0.1	µg/L			
50-32-8	Benzo[a]pyrene	ND	0.1	µg/L			
193-39-5	Indeno[1,2,3-cd]pyrene	ND	0.1	µg/L			
53-70-3	Dibenz[a,h]anthracene	ND	0.1	µg/L			
191-24-2	Benzo[g,h,i]perylene	ND	0.1	µg/L			
		Surrogate	Recovery	Limit			
		2-Fluorophenol	56. %	0 - 141.			
		Phenol-d6	37. %	0 - 120			
		2,4,6-Tribromophenol	88. %	0 - 279.			
		1,2-Dichlorobenzene-d4	85. %	49. - 127.			
		Nitrobenzene-d5	99. %	0 - 183.			
		2-Fluorobiphenyl	92. %	57. - 131.			

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<p>Sampled: 10/18/1999 Extracted: 10/22/1999 Analyzed: 10/25/1999 by PB</p>						
BSW99-04	Water	L13502-48				
91-20-3	Naphthalene.....	ND	0.1	µg/L		
208-96-8	Acenaphthylene.....	ND	0.1	µg/L		
83-32-9	Acenaphthene.....	1.2	0.1	µg/L		
86-73-7	Fluorene.....	0.7	0.1	µg/L		
87-86-5	Pentachlorophenol.....	ND	0.5	µg/L		
85-01-8	Phenanthrene.....	0.5	0.1	µg/L		
120-12-7	Anthracene.....	ND	0.1	µg/L		
206-44-0	Fluoranthene.....	0.4	0.1	µg/L		
129-00-0	Pyrene.....	0.2	0.1	µg/L		
56-55-3	Benzo[a]anthracene.....	ND	0.1	µg/L		
218-01-9	Chrysene.....	ND	0.1	µg/L		
205-99-2	Benzo[b]fluoranthene.....	ND	0.1	µg/L		
207-08-9	Benzo[k]fluoranthene.....	ND	0.1	µg/L		
50-32-8	Benzo[a]pyrene.....	ND	0.1	µg/L		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	0.1	µg/L		
53-70-3	Dibenz[a,h]anthracene.....	ND	0.1	µg/L		
91-24-2	Benzo[g,h,i]perylene.....	ND	0.1	µg/L		
Surrogate		Recovery		Limit		
2-Fluorophenol		59. %		0 - 141.		
Phenol-d6		37. %		0 - 120		
2,4,6-Tribromophenol		90. %		0 - 279.		
1,2-Dichlorobenzene-d4		91. %		49. - 127.		
Nitrobenzene-d5		105. %		0 - 183.		
2-Fluorobiphenyl		98. %		57. - 131.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix						Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment	
MBSW99-05	Water						L13502-49
91-20-3	Naphthalene	1.1	0.1	µg/L			
208-96-8	Acenaphthylene	ND	0.1	µg/L			
83-32-9	Acenaphthene	0.4	0.1	µg/L			
86-73-7	Fluorene	0.3	0.1	µg/L			
87-86-5	Pentachlorophenol	ND	1.0	µg/L			
85-01-8	Phenanthrene	0.4	0.1	µg/L			
120-12-7	Anthracene	ND	0.1	µg/L			
206-44-0	Fluoranthene	0.2	0.1	µg/L			
129-00-0	Pyrene	0.1	0.1	µg/L			
56-55-3	Benzo[a]anthracene	ND	0.1	µg/L			
218-01-9	Chrysene	ND	0.1	µg/L			
205-99-2	Benzo[b]fluoranthene	ND	0.1	µg/L			
207-08-9	Benzo[k]fluoranthene	ND	0.1	µg/L			
50-32-8	Benzo[a]pyrene	ND	0.1	µg/L			
193-39-5	Indeno[1,2,3-cd]pyrene	ND	0.1	µg/L			
53-70-3	Dibenz[a,h]anthracene	ND	0.1	µg/L			
191-24-2	Benzo[g,h,i]perylene	ND	0.1	µg/L			
		Surrogate	Recovery		Limit		
		2-Fluorophenol	56. %		0 - 141.		
		Phenol-d6	35. %		0 - 120		
		2,4,6-Tribromophenol	84. %		0 - 279.		
		1,2-Dichlorobenzene-d4	85. %		49. - 127.		
		Nitrobenzene-d5	98. %		0 - 183.		
		2-Fluorobiphenyl	92. %		57. - 131.		

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Polynuclear Aromatic Hydrocarbons (PNA)

by EPA 8270 SIM

Sample ID	Matrix					Lab Number
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
				Sampled: 10/18/1999		
				Extracted: 10/22/1999		
BSW99-07	Water	Analyzed: 10/25/1999 by PB			L13502-50	
91-20-3	Naphthalene.....	ND	0.1	µg/L		
208-96-8	Acenaphthylene.....	ND	0.1	µg/L		
33-32-9	Acenaphthene.....	1.1	0.1	µg/L		
86-73-7	Fluorene.....	0.7	0.1	µg/L		
87-86-5	Pentachlorophenol.....	ND	1.0	µg/L		
85-01-8	Phenanthrene.....	0.5	0.1	µg/L		
120-12-7	Anthracene.....	ND	0.1	µg/L		
206-44-0	Fluoranthene.....	0.4	0.1	µg/L		
29-00-0	Pyrene.....	0.2	0.1	µg/L		
56-55-3	Benzo[a]anthracene.....	ND	0.1	µg/L		
218-01-9	Chrysene.....	ND	0.1	µg/L		
205-99-2	Benzo[b]fluoranthene.....	ND	0.1	µg/L		
207-08-9	Benzo[k]fluoranthene.....	ND	0.1	µg/L		
20-32-8	Benzo[a]pyrene.....	ND	0.1	µg/L		
93-39-5	Indeno[1,2,3-cd]pyrene.....	ND	0.1	µg/L		
53-70-3	Dibenz[a,h]anthracene.....	ND	0.1	µg/L		
91-24-2	Benzo[g,h,i]perylene.....	ND	0.1	µg/L		
Surrogate				Recovery	Limit	
2-Fluorophenol				57. %	0 - 141.	
Phenol-d6				36. %	0 - 120	
2,4,6-Tribromophenol				83. %	0 - 279.	
1,2-Dichlorobenzene-d4				84. %	49. - 127.	
Nitrobenzene-d5				98. %	0 - 183.	
2-Fluorobiphenyl				91. %	57. - 131.	



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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number				
CAS	Analyte	Result	Reporting Limit	Units (ppb)	Dilution	Comment
<p>Sampled: 10/18/1999 Extracted: 10/22/1999 Analyzed: 10/26/1999 by PB</p>						
MBSW99-08	Water	L13502-51				
91-20-3	Naphthalene.....	ND	0.1	µg/L		
208-96-8	Acenaphthylene.....	ND	0.1	µg/L		
83-32-9	Acenaphthene.....	ND	0.1	µg/L		
86-73-7	Fluorene.....	ND	0.1	µg/L		
87-86-5	Pentachlorophenol.....	ND	1.0	µg/L		
85-01-8	Phenanthrene.....	ND	0.1	µg/L		
120-12-7	Anthracene.....	ND	0.1	µg/L		
206-44-0	Fluoranthene.....	ND	0.1	µg/L		
129-00-0	Pyrene.....	ND	0.1	µg/L		
56-55-3	Benzo[a]anthracene.....	ND	0.1	µg/L		
218-01-9	Chrysene.....	ND	0.1	µg/L		
205-99-2	Benzo[b]fluoranthene.....	ND	0.1	µg/L		
207-08-9	Benzo[k]fluoranthene.....	ND	0.1	µg/L		
50-32-8	Benzo[a]pyrene.....	ND	0.1	µg/L		
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	0.1	µg/L		
53-70-3	Dibenz[a,h]anthracene.....	ND	0.1	µg/L		
191-24-2	Benzo[g,h,i]perylene.....	ND	0.1	µg/L		
Surrogate		Recovery		Limit		
2-Fluorophenol		54. %		0 - 141.		
Phenol-d6		34. %		0 - 120		
2,4,6-Tribromophenol		81. %		0 - 279.		
1,2-Dichlorobenzene-d4		81. %		49. - 127.		
Nitrobenzene-d5		94. %		0 - 183.		
2-Fluorobiphenyl		89. %		57. - 131.		

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Polynuclear Aromatic Hydrocarbons (PNA) by EPA 8270 SIM

Sample ID	Matrix	Lab Number
CAS	Analyte	Result Reporting Limit Units (ppb) Dilution Comment

1BSE099-09 **Water** **Sampled: 10/19/1999**
Extracted: 10/25/1999
Analyzed: 10/25/1999 by PB **L13502-57**

91-20-3	Naphthalene.....	ND	0.1	µg/L
208-96-8	Acenaphthylene.....	ND	0.1	µg/L
83-32-9	Acenaphthene.....	ND	0.1	µg/L
86-73-7	Fluorene.....	ND	0.1	µg/L
87-86-5	Pentachlorophenol.....	ND	1.0	µg/L
85-01-8	Phenanthrene.....	ND	0.1	µg/L
120-12-7	Anthracene.....	ND	0.1	µg/L
206-44-0	Fluoranthene.....	ND	0.1	µg/L
129-00-0	Pyrene.....	ND	0.1	µg/L
56-55-3	Benzo[a]anthracene.....	ND	0.1	µg/L
218-01-9	Chrysene.....	ND	0.1	µg/L
205-99-2	Benzo[b]fluoranthene.....	ND	0.1	µg/L
207-08-9	Benzo[k]fluoranthene.....	ND	0.1	µg/L
50-32-8	Benzo[a]pyrene.....	ND	0.1	µg/L
193-39-5	Indeno[1,2,3-cd]pyrene.....	ND	0.1	µg/L
53-70-3	Dibenz[a,h]anthracene.....	ND	0.1	µg/L
91-24-2	Benzo[g,h,i]perylene.....	ND	0.1	µg/L

Surrogate	Recovery	Limit
2-Fluorophenol	47. %	0 - 141.
Phenol-d6	33. %	0 - 120
2,4,6-Tribromophenol	68. %	0 - 279.
1,2-Dichlorobenzene-d4	72. %	49. - 127.
Nitrobenzene-d5	82. %	0 - 183.
2-Fluorobiphenyl	71. %	57. - 131.

OREGON ANALYTICAL LABORATORY

A Division of Portland General Electric
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DETERMINATION OF PCDD/PCDF LEVELS

Prepared for:
Oregon Analytical Laboratory
Attn: Sandy Wright
14855 S.W. Scholls Ferry Road
Beaverton, OR 97007

Project: Chemical Analysis

Client Purchase Order Number: NA

REPORT OF LABORATORY ANALYSIS

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PROJECT: PCDD/PCDF ANALYSES

DATE: November 23, 1999

ISSUED TO: Oregon Analytical Laboratory
Attn: Ms. Sandy Wright
14855 S.W. Scholls Ferry Road
Beaverton, OR 97007

REPORT NO: 99-1022859

INTRODUCTION

This report presents the results from the analyses performed on twelve samples which were submitted by a representative of Oregon Analytical Laboratory. The samples were analyzed for the presence or absence of polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) using a modified version of USEPA Method 8290 as described below.

SAMPLE IDENTIFICATION

<u>Client ID</u>	<u>Sample Type</u>	<u>Date Received</u>	<u>Pace ID</u>
L13502-5	Solid	10/18/99	1604007
L13502-8	Solid	10/18/99	1604015
L13502-9	Solid	10/18/99	1604023
L13502-10	Solid	10/18/99	1604031
L13502-11	Solid	10/18/99	1604049
L13502-17	Solid	10/19/99	1609584
L13502-20	Solid	10/19/99	1609592
L13502-23	Solid	10/19/99	1609600
L13502-36	Solid	10/20/99	1615904
L13502-38	Solid	10/20/99	1615920
L13502-42	Solid	10/20/99	1615995
L13502-44	Solid	10/20/99	1616001

METHODOLOGY**Sample Extraction**

A portion of each sample was spiked with $^{13}\text{C}_{12}$ -labeled PCDD/PCDF internal standards (Table 1) and extracted with toluene in a Soxhlet extractor. The extract was quantitatively transferred to a Kuderna-Danish concentrator, concentrated, and solvent exchanged to hexane. The hexane extract was then spiked with 2,3,7,8-TCDD- $^{37}\text{Cl}_4$ enrichment efficiency standard (Table 1) and processed through the analyte enrichment procedures described below. Moisture content was determined by taking an aliquot of each solid sample to constant weight in an oven.

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REPORT OF: CHEMICAL ANALYSESTel: 612-607-1700
Fax: 612-607-6444**PROJECT: PCDD/PCDF ANALYSES****DATE: November 23, 1999****PAGE: 2****REPORT NO: 99-1022859****PCDD/PCDF Analyte Enrichment**

The extraction procedure often removes a variety of compounds, in addition to the PCDDs and PCDFs, from the sample matrix. Some of these compounds can directly interfere with the analyses while others can overload the capillary column causing degradation in chromatographic resolution or sensitivity. The analyte enrichment steps described below are used to remove interferences from the extracts.

Each extract was diluted to 100 mL with hexane, transferred to a separatory funnel, and washed with 1N sodium hydroxide, concentrated sulfuric acid, and aqueous sodium chloride (5% w/v) as needed. The hexane extract was quantitatively transferred to a liquid chromatography column containing alternating layers of silica gel, 40% concentrated sulfuric acid on silica gel, and 33% 1 N sodium hydroxide on silica gel. The column was eluted with 90 mL of hexane and the entire eluate was collected and concentrated, under ambient conditions, to a volume of 1 mL.

Each extract was then fractionated on a liquid chromatography column containing 4 g of activated alumina. The column was eluted with 20 mL of hexane followed by 15 mL of 60% methylene chloride/hexane. The 60% methylene chloride/hexane fraction was concentrated to 1 mL under a stream of dry nitrogen and applied to the top of a chromatography column containing 1 g of 5% AX-21 activated carbon in silica gel. The column was eluted with two 2-mL portions of hexane, 2 mL of cyclohexane/methylene chloride (50:50 v/v) and cyclohexane/methanol/toluene (75:20:5 v/v) in the forward direction, and then with toluene in the reverse direction. The toluene fraction was collected, concentrated, spiked with recovery standards (1,2,3,4-TCDD-¹³C₁₂ and 1,2,3,7,8,9-HxCDD-¹³C₁₂) and taken to a final volume of 20 uL.

PCDD/PCDF Analyses

Each sample extract was analyzed for the presence of PCDDs and PCDFs using combined capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The instrumentation consisted of a Hewlett Packard Model 5890 gas chromatograph interfaced to a VG Model 70SE high-resolution mass spectrometer. The capillary column was interfaced directly into the ion source of the mass spectrometer, thus providing the highest possible sensitivity while minimizing degradation of the chromatographic resolution.

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Fax: 612-607-6444**PROJECT: PCDD/PCDF ANALYSES****DATE: November 23, 1999****PAGE: 3****REPORT NO: 99-1022859****PCDD/PCDF Analyses (Cont.)**

The mass spectrometer was operated in the electron impact ionization mode at a mass resolution of 10,000-11,000 ($M/\Delta M$, 10 percent valley definition). This resolution is sufficient to resolve most interferences, such as PCBs, thus providing the highest level of confidence that the detected levels of PCDD/PCDF were not false positives resulting from interferences. Typical operating parameters for the HRGC/HRMS analyses are summarized in Table 2.

The data were acquired by selected-ion-recording (SIR) using groups of ion masses similar to those described in USEPA Method 8290. The five groups corresponded to the tetrachlorinated through octachlorinated congener classes. Each group contained two ion masses for the PCDDs, two ion masses for the PCDFs, the corresponding ion masses from the two isotopically labeled internal standards, and the ion mass characteristic of the polychlorinated diphenylether (PCDE) which, if present, could cause false responses in the dibenzofuran channels.

Each group of ion masses also contained a lock mass which was used by the data system to automatically correct the mass focus of the instrument. The data system determined the centroid of the lock mass during each data acquisition cycle and corrected the mass focus of the analyte and internal standard ion masses to assure that the centers of the mass peaks were being monitored.

The criteria used to judge positive responses for a PCDD/PCDF isomer included:

- * Simultaneous response at both ion masses of the PCDD or PCDF
- * Signal-to-noise ratio equal to or greater than 2.5:1.0 for both ion masses
- * Chlorine isotope ratio within 15% of the theoretical value
- * Chromatographic retention time within ± 2 seconds of the expected retention time
- * Chromatographic retention times within elution windows determined from analyses of standard mixtures
- * Absence of simultaneous response in the PCDF and PCDPE ion traces

A list of the exact ion masses monitored for the determination of PCDD/PCDF isomers and the PCDE interferences is presented in Table 3. Also included are the theoretical chlorine isotope ratios for the ten congener classes.

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PROJECT: PCDD/PCDF ANALYSES

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PCDD/PCDF Quantification and Calculations

The PCDD/PCDF isomers were quantified by comparison of their responses to the responses of the labeled internal standards. Relative response factors were calculated from analyses of standard mixtures containing representatives of each of the PCDD/PCDF congener classes at five concentration levels, and each of the internal standards at one concentration level, as shown in Table 4. The PCDD/PCDF response factors were calculated by comparing the sum of the responses from the two ion masses monitored for each chlorine congener class to the sum of the responses from the two ion masses of the corresponding isotopically labeled internal standard. The formula for the response factor calculation is:

$$R_f = \frac{A_n \times Q_{is}}{A_{is} \times Q_n}$$

where:

Rf = Response factor
An = Sum of integrated areas for native isomer
Qis = Quantity of labeled internal standard
Ais = Sum of integrated areas for labeled internal standard
Qn = Quantity of native isomer

The levels of PCDD/PCDF in each sample were quantified using the following equation:

$$C = \frac{A_n \times Q_{is}}{A_{is} \times W \times R_f}$$

where:

C = Concentration of target isomer or congener class
An = Sum of integrated areas for the target isomer or congener class
Qis = Quantity of labeled internal standard added to the sample
Ais = Sum of integrated areas for the labeled internal standard
W = Sample amount
Rf = Response factor

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Fax: 612-607-6444**PROJECT: PCDD/PCDF ANALYSES****DATE: November 23, 1999****PAGE: 5****REPORT NO: 99-1022859****PCDD/PCDF Quantification and Calculations (Cont.)**

Each pair of ion mass peaks in the selected-ion-current chromatograms was evaluated manually to determine if it met the criteria for a PCDD or PCDF isomer. Areas of all peaks exhibiting correct ion ratios, having retention times within the correct windows, and having areas corresponding to concentrations in the range covered by the initial calibration were then summed for calculations of total congener concentrations. The toxic equivalence of each sample was calculated using the factors listed in Table 5.

A limit of detection (LOD) based on producing a signal that is 2.5 times the noise level, was calculated for each undetected 2,3,7,8-substituted isomer of any tetra through octa chlorinated congener class. The noise heights used to calculate the detection limits were measured at the retention time of the specific isomer. The formula used for calculating the LOD is:

$$\text{LOD} = \frac{\text{Hn} \times \text{Qis} \times 2.5}{\text{His} \times \text{W} \times \text{Rf}}$$

where:

LOD = Single isomer limit of detection
Hn = Sum of noise heights at native isomer retention time
Qis = Quantity of labeled internal standard
His = Sum of peak heights for labeled internal standard
W = Sample amount
Rf = Response factor

The recovery of the 2,3,7,8-TCDD-³⁷Cl₄ enrichment efficiency standard and each ¹³C₁₂-labeled internal standard, relative to either 1,2,3,4-TCDD-¹³C₁₂ or 1,2,3,7,8,9-HxCDD-¹³C₁₂, was calculated using the following equation:

$$\%R = \frac{\text{Ais} \times \text{Qrs} \times 100\%}{\text{Rfr} \times \text{Ars} \times \text{Qis}}$$

where:

%R = Percent recovery of labeled internal standard
Ais = Sum of integrated areas of labeled internal standard
Qrs = Quantity of recovery standard
Ars = Sum of integrated areas of recovery standard
Rfr = Response factor of the specific labeled internal standard relative to the recovery standard
Qis = Quantity of the labeled internal standard congener added to the sample

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Quality Control for PCDD/PCDF Analyses

The performance of the sample processing steps and the instrumentation are monitored on a routine basis. The procedures and criteria are summarized below.

One method blank and one laboratory spike sample are typically prepared with each ten samples of any given matrix. Recoveries of the native PCDD/PCDF analytes in the laboratory spike samples generally range from 70 to 130%. Recoveries of selected analytes outside this range do not invalidate the data but provide information, which is used by the laboratory to monitor recovery trends and to assure optimization of the method.

Internal standards are spiked into each sample prior to extraction in order to monitor the level of recovery, which is achieved for each individual sample. Acceptable recoveries range from 40 to 135 percent for the internal standards unless a deviation is due to variation in instrument response as a result of analytical interferences.

The resolution of the mass spectrometer is verified prior to each analysis to be 10,000 or greater. Hardcopies of the reference peaks are printed at the beginning and end of each analysis day. The resolving power of the DB-5MS chromatographic column is checked daily by analyzing a standard solution containing 2,3,7,8-TCDD and the adjacent TCDD isomers. The DB-225 column resolution is checked daily by analyzing a standard solution containing 2,3,7,8-TCDF and the adjacent TCDF isomers. Acceptable performance is achieved when 2,3,7,8-TCDD or 2,3,7,8-TCDF is resolved from the adjacent isomers by a valley of 25% or less. The group times for the selected-ion-monitoring data acquisitions are also checked daily by analyzing the column performance mix which has been modified to contain the first and last eluting isomers of each congener class. In this way one is assured of collecting data representative of the total PCDD/PCDF content and that the 2,3,7,8-substituted isomers are suitably resolved.

Initial calibrations are generated by analyzing standard solutions (see Table 4) containing target native and labeled PCDD/PCDF compounds. Response factors are calculated and averaged for each compound. These averages are used for quantification and for comparison to the daily continuing calibration. The relative standard deviation for each native compound must be 20% or less (30% or less for the labeled compounds) as specified in Method 8290. A continuing calibration standard is analyzed at the beginning and end of each 12-hour shift on days when initial calibrations are not performed. The initial calibration is considered to be valid when the response factors from the continuing calibration analysis fall to within the ranges specified in Method 8290.

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RESULTS

The results from the analyses are presented in the following:

- Appendix A - Chain of Custody Documentation
- Appendix B - PCDD/PCDF Analysis Results
- Appendix C - QC Sample Data
- Appendix D - Sample Chromatograms & Raw Data
- Appendix E - Standard Chromatograms & Raw Data
- Appendix F - QC Sample Chromatograms

DISCUSSION

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 44-112% and indicate a generally high level of efficiency through the extraction and enrichment steps. All of the internal standard recoveries obtained for this project were within the target ranges specified in Method 8290. Also, since the quantifications of the native 2,3,7,8-substituted isomers were based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

As we discussed, the results from the second column confirmation of the 2,3,7,8-TCDF concentrations are not included in this report. The results of the confirmation analyses are available upon request.

Some of the samples were found to contain polychlorinated diphenylethers (PCDEs) and other compounds, which interfere with the determination of co-eluting PCDD and PCDF isomers. Any responses in the PCDF ion traces with corresponding responses in the PCDE ion traces are not included in the reported PCDF concentrations. Any affected 2,3,7,8-substituted isomers are flagged "E" or on the data summary sheets.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results, found at the beginning of Appendix C, show the blank to be free of PCDDs and PCDFs at the reported detection limits. This indicates that the sample preparation procedures did not significantly impact the results of the field sample determinations.

A laboratory spike and spike duplicate were also prepared with the sample batch by extracting clean sand that had been fortified with native standard materials. The results, found at the end of Appendix B, show that the spiked native compounds were recovered at 104-131% with relative percent differences of 0.0-17.4%. This indicates high degrees of accuracy and precision for these determinations.

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PROJECT: PCDD/PCDF ANALYSES

DATE: November 23, 1999

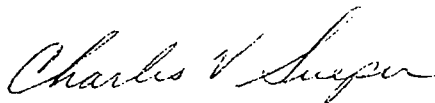
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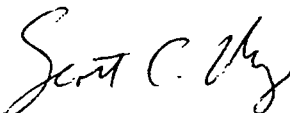
REMARKS

The sample extracts will be retained for a period of 30 days from the date of this report and then discarded unless other arrangements are made. The raw mass spectral data will be archived on magnetic tape for a period of not less than one year. Questions regarding the data contained in this report may be directed to the authors at the numbers provided below.

Pace Analytical Services, Inc.



Charles V. Sueper, Manager
High Resolution Mass Spectrometry
(612) 607-6387



Scott C. Unze
Project Manager, Dioxins
(612) 607-6383

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-5
Lab Sample ID.....1604007
Filename.....S91104G
Injected By.....BAL
Total Amount Extracted...0.0223 kg
% Moisture.....54.1 %
Dry Weight Extracted.....0.0102 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104B
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution....NA
Collected...10/12/99
Received....10/18/99
Extracted...10/25/99
Analyzed....11/04/99 21:22

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.7 <i>JS</i>	1.0	2378-TCDF-13C....	2.00	89
TOTAL TCDF	12.0	-----	2378-TCDD-13C....	2.00	86
2378-TCDD	ND	1.0	12378-PeCDF-13C..	2.00	82
TOTAL TCDD	5.0	-----	23478-PeCDF-13C..	2.00	81
12378-PeCDF	ND	4.9	12378-PeCDD-13C..	2.00	81
23478-PeCDF	7.2	4.9	123478-HxCDF-13C.	2.00	95
TOTAL PeCDF	38.0	-----	123678-HxCDF-13C.	2.00	91
12378-PeCDD	ND	4.9	234678-HxCDF-13C.	2.00	91
TOTAL PeCDD	5.6	-----	123789-HxCDF-13C.	2.00	96
123478-HxCDF	11.0	4.9	123478-HxCDD-13C.	2.00	90
123678-HxCDF	ND <i>EUS</i>	12.0	123678-HxCDD-13C.	2.00	97
234678-HxCDF	ND	4.9	1234678-HpCDF-13C	2.00	74
123789-HxCDF	ND	4.9	1234789-HpCDF-13C	2.00	78
TOTAL HxCDF	130.0	-----	1234678-HpCDD-13C	2.00	82
123478-HxCDD	ND	4.9	OCDD-13C.....	4.00	75
123678-HxCDD	16.0	4.9	1234-TCDD-13C....	2.00	NA
123789-HxCDD	6.8	4.9	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	93.0	-----	2378-TCDD-37C14..	0.20	77
1234678-HpCDF	37.0	4.9			
1234789-HpCDF	ND	4.9			
TOTAL HpCDF	140.0	-----			
1234678-HpCDD	220.0	4.9			
TOTAL HpCDD	440.0	-----			
OCDF	65.0	9.8			
OCDD	1600.0	9.8			

* Value may include contributions from other TCDF isomers.

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)

PRL = Pace Reporting Limit

ND = Not Detected

NA = Not Applicable

E = PCDE Interference

13124

Report No...99-1022859

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-8
Lab Sample ID.....1604015
Filename.....S91104H
Injected By.....BAL
Total Amount Extracted...0.0110 kg
% Moisture.....7.4 %
Dry Weight Extracted.....0.0102 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104B
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution....NA
Collected...10/13/99
Received....10/18/99
Extracted...10/25/99
Analyzed....11/04/99 22:25

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	86
TOTAL TCDF	1.8	-----	2378-TCDD-13C....	2.00	91
			12378-PeCDF-13C..	2.00	85
2378-TCDD	ND	1.0	23478-PeCDF-13C..	2.00	82
TOTAL TCDD	ND	-----	12378-PeCDD-13C..	2.00	85
			123478-HxCDF-13C.	2.00	94
12378-PeCDF	ND	4.9	123678-HxCDF-13C.	2.00	91
23478-PeCDF	ND	4.9	234678-HxCDF-13C.	2.00	94
TOTAL PeCDF	8.6	-----	123789-HxCDF-13C.	2.00	99
			123478-HxCDD-13C.	2.00	94
12378-PeCDD	6.3	4.9	123678-HxCDD-13C.	2.00	90
TOTAL PeCDD	6.3	-----	1234678-HpCDF-13C	2.00	85
			1234789-HpCDF-13C	2.00	98
123478-HxCDF	13.0	4.9	1234678-HpCDD-13C	2.00	98
123678-HxCDF	ND	14.0	OCDD-13C.....	4.00	100
234678-HxCDF	7.7	4.9			
123789-HxCDF	ND	4.9	1234-TCDD-13C....	2.00	NA
TOTAL HxCDF	210.0	-----	123789-HxCDD-13C.	2.00	NA
123478-HxCDD	12.0	4.9	2378-TCDD-37C14..	0.20	75
123678-HxCDD	59.0	4.9			
123789-HxCDD	23.0	4.9			
TOTAL HxCDD	280.0	-----			
1234678-HpCDF	80.0	4.9			
1234789-HpCDF	6.9	4.9			
TOTAL HpCDF	330.0	-----			
1234678-HpCDD	880.0	4.9			
TOTAL HpCDD	1600.0	-----			
OCDF	240.0	9.8			
OCDD	5800.0	9.8			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1022859

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-9	Matrix.....SOIL
Lab Sample ID.....1604023	Dilution....NA
Filename.....S91104I	Collected...10/13/99
Injected By.....MCH	Received....10/18/99
Total Amount Extracted...0.0112 kg	Extracted...10/25/99
% Moisture.....8.8 %	Analyzed....11/04/99 23:32
Dry Weight Extracted...0.0102 kg	
ICAL Date.....10/14/99	
CCAL Filename(s).....S91104B	
Method Blank ID.....BLANK-102599	

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	4.0 <i>#J</i>	1.0	2378-TCDF-13C....	2.00	72
TOTAL TCDF	21.0	-----	2378-TCDD-13C....	2.00	77
2378-TCDD	2.9	1.0	12378-PeCDF-13C..	2.00	73
TOTAL TCDD	19.0	-----	23478-PeCDF-13C..	2.00	75
12378-PeCDF	10.0	4.9	12378-PeCDD-13C..	2.00	77
23478-PeCDF	25.0	4.9	123478-HxCDF-13C.	2.00	95
TOTAL PeCDF	86.0	-----	123678-HxCDF-13C.	2.00	95
12378-PeCDD	25.0	4.9	234678-HxCDF-13C.	2.00	85
TOTAL PeCDD	140.0	-----	123789-HxCDF-13C.	2.00	90
123478-HxCDF	39.0	4.9	123478-HxCDD-13C.	2.00	90
123678-HxCDF	ND <i>E/45</i>	38.0	123678-HxCDD-13C.	2.00	95
234678-HxCDF	33.0	4.9	1234678-HpCDF-13C	2.00	80
123789-HxCDF	18.0	4.9	1234789-HpCDF-13C	2.00	84
TOTAL HxCDF	910.0	-----	1234678-HpCDD-13C	2.00	93
123478-HxCDD	56.0	4.9	OCDD-13C.....	4.00	86
123678-HxCDD	300.0	4.9	1234-TCDD-13C....	2.00	NA
123789-HxCDD	110.0	4.9	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	1300.0	-----	2378-TCDD-37C14..	0.20	60
1234678-HpCDF	260.0	4.9			
1234789-HpCDF	20.0	4.9			
TOTAL HpCDF	850.0	-----			
1234678-HpCDD	4200.0	4.9			
TOTAL HpCDD	7500.0	-----			
OCDF	360.0	9.8			
OCDD	27000.0	9.8			

* Value may include contributions from other TCDF isomers.

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

13144

Report No...99-1022859

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-10
Lab Sample ID.....1604031
Filename.....S91104J
Injected By.....MCH
Total Amount Extracted...0.0108 kg
% Moisture.....2.8 %
Dry Weight Extracted.....0.0105 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104B
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution....NA
Collected...10/13/99
Received...10/18/99
Extracted...10/25/99
Analyzed....11/05/99 00:49

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	69
TOTAL TCDF	ND	-----	2378-TCDD-13C....	2.00	75
2378-TCDD	3.1	1.0	12378-PeCDF-13C..	2.00	83
TOTAL TCDD	12.0	-----	23478-PeCDF-13C..	2.00	83
12378-PeCDF	ND	4.8	12378-PeCDD-13C..	2.00	86
23478-PeCDF	7.6	4.8	123478-HxCDF-13C.	2.00	95
TOTAL PeCDF	27.0	-----	123678-HxCDF-13C.	2.00	95
12378-PeCDD	18.0	4.8	234678-HxCDF-13C.	2.00	94
TOTAL PeCDD	80.0	-----	123789-HxCDF-13C.	2.00	102
123478-HxCDF	18.0	4.8	123478-HxCDD-13C.	2.00	94
123678-HxCDF	ND	16.0	123678-HxCDD-13C.	2.00	99
234678-HxCDF	9.9	4.8	1234678-HpCDF-13C	2.00	85
123789-HxCDF	5.1	4.8	1234789-HpCDF-13C	2.00	96
TOTAL HxCDF	270.0	-----	1234678-HpCDD-13C	2.00	98
123478-HxCDD	24.0	4.8	OCDD-13C.....	4.00	94
123678-HxCDD	86.0	4.8	1234-TCDD-13C....	2.00	NA
123789-HxCDD	49.0	4.8	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	560.0	-----	2378-TCDD-37C14..	0.20	71
1234678-HpCDF	110.0	4.8			
1234789-HpCDF	8.3	4.8			
TOTAL HpCDF	400.0	-----			
1234678-HpCDD	1400.0	4.8			
TOTAL HpCDD	2900.0	-----			
OCDF	240.0	9.5			
OCDD	9400.0	9.5			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1022859

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-11
Lab Sample ID.....1604049
Filename.....S91104K
Injected By.....MCH
Total Amount Extracted...0.0125 kg
% Moisture.....8.8 %
Dry Weight Extracted.....0.0114 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104B
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution....NA
Collected...10/13/99
Received....10/18/99
Extracted...10/25/99
Analyzed....11/05/99 01:51

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	4.8 <i>JS</i>	0.9	2378-TCDF-13C....	2.00	79
TOTAL TCDF	19.0	-----	2378-TCDD-13C....	2.00	85
2378-TCDD	4.0	0.9	12378-PeCDF-13C..	2.00	87
TOTAL TCDD	12.0	-----	23478-PeCDF-13C..	2.00	44
12378-PeCDF	ND	4.4	12378-PeCDD-13C..	2.00	65
23478-PeCDF	ND <i>E/US</i>	34.0	123478-HxCDF-13C.	2.00	96
TOTAL PeCDF	100.0	-----	123678-HxCDF-13C.	2.00	99
12378-PeCDD	48.0	4.4	234678-HxCDF-13C.	2.00	77
TOTAL PeCDD	210.0	-----	123789-HxCDF-13C.	2.00	80
123478-HxCDF	67.0	4.4	123478-HxCDD-13C.	2.00	90
123678-HxCDF	ND <i>E/US</i>	61.0	123678-HxCDD-13C.	2.00	89
234678-HxCDF	25.0	4.4	1234678-HpCDF-13C	2.00	78
123789-HxCDF	31.0	4.4	1234789-HpCDF-13C	2.00	95
TOTAL HxCDF	1800.0	-----	1234678-HpCDD-13C	2.00	97
123478-HxCDD	89.0	4.4	OCDD-13C.....	4.00	112
123678-HxCDD	460.0	4.4	1234-TCDD-13C....	2.00	NA
123789-HxCDD	180.0	4.4	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	2000.0	-----	2378-TCDD-37C14..	0.20	73
1234678-HpCDF	490.0	4.4			
1234789-HpCDF	33.0	4.4			
TOTAL HpCDF	1400.0	-----			
1234678-HpCDD	6300.0	4.4			
TOTAL HpCDD	11000.0	-----			
OCDF	630.0	8.8			
OCDD	39000.0	8.8			

* Value may include contributions from other TCDF isomers.

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

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Report No...99-1022859

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Minneapolis, MN 55414

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-17
Lab Sample ID.....1609584
Filename.....S91104L
Injected By.....MCH
Total Amount Extracted...0.0163 kg
% Moisture.....38.1 %
Dry Weight Extracted.....0.0101 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104B
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution....NA
Collected...10/14/99
Received...10/19/99
Extracted...10/25/99
Analyzed....11/05/99 02:56

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	6.0 <i>*J</i>	1.0	2378-TCDF-13C....	2.00	82
TOTAL TCDF	24.0	-----	2378-TCDD-13C....	2.00	87
2378-TCDD	2.6	1.0	12378-PeCDF-13C..	2.00	84
TOTAL TCDD	22.0	-----	23478-PeCDF-13C..	2.00	81
12378-PeCDF	13.0	5.0	12378-PeCDD-13C..	2.00	83
23478-PeCDF	34.0	5.0	123478-HxCDF-13C.	2.00	112
TOTAL PeCDF	110.0	-----	123678-HxCDF-13C.	2.00	109
12378-PeCDD	18.0	5.0	234678-HxCDF-13C.	2.00	106
TOTAL PeCDD	80.0	-----	123789-HxCDF-13C.	2.00	109
123478-HxCDF	66.0	5.0	123478-HxCDD-13C.	2.00	106
123678-HxCDF	ND <i>*US</i>	54.0	123678-HxCDD-13C.	2.00	107
234678-HxCDF	38.0	5.0	1234678-HpCDF-13C	2.00	87
123789-HxCDF	24.0	5.0	1234789-HpCDF-13C	2.00	92
TOTAL HxCDF	1100.0	-----	1234678-HpCDD-13C	2.00	100
123478-HxCDD	33.0	5.0	OCDD-13C.....	4.00	90
123678-HxCDD	250.0	5.0	1234-TCDD-13C....	2.00	NA
123789-HxCDD	73.0	5.0	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	970.0	-----	2378-TCDD-37C14..	0.20	80
1234678-HpCDF	330.0	5.0			
1234789-HpCDF	29.0	5.0			
TOTAL HpCDF	1300.0	-----			
1234678-HpCDD	3800.0	5.0			
TOTAL HpCDD	6900.0	-----			
OCDF	740.0	9.9			
OCDD	29000.0	9.9			

* Value may include contributions from other TCDF isomers.

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1023072

REPORT OF LABORATORY ANALYSIS

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-20	
Lab Sample ID.....1609592	
Filename.....S91105H	
Injected By.....CS	
Total Amount Extracted...0.0228 kg	Matrix.....SOIL
% Moisture.....55.2 %	Dilution....NA
Dry Weight Extracted.....0.0102 kg	Collected...10/14/99
ICAL Date.....10/14/99	Received....10/19/99
CCAL Filename(s).....S91104M	Extracted...10/25/99
Method Blank ID.....BLANK-102599	Analyzed....11/05/99 14:00

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.9 <i>#J</i>	1.0	2378-TCDF-13C....	2.00	77
TOTAL TCDF	3.3	-----	2378-TCDD-13C....	2.00	82
2378-TCDD	1.2	1.0	12378-PeCDF-13C..	2.00	86
TOTAL TCDD	4.0	-----	23478-PeCDF-13C..	2.00	85
12378-PeCDF	ND	4.9	12378-PeCDD-13C..	2.00	84
23478-PeCDF	9.0	4.9	123478-HxCDF-13C.	2.00	95
TOTAL PeCDF	49.0	-----	123678-HxCDF-13C.	2.00	94
12378-PeCDD	8.6	4.9	234678-HxCDF-13C.	2.00	95
TOTAL PeCDD	22.0	-----	123789-HxCDF-13C.	2.00	99
123478-HxCDF	21.0	4.9	123478-HxCDD-13C.	2.00	93
123678-HxCDF	ND <i>EUS</i>	19.0	123678-HxCDD-13C.	2.00	88
234678-HxCDF	10.0	4.9	1234678-HpCDF-13C	2.00	85
123789-HxCDF	6.6	4.9	1234789-HpCDF-13C	2.00	92
TOTAL HxCDF	300.0	-----	1234678-HpCDD-13C	2.00	91
123478-HxCDD	15.0	4.9	OCDD-13C.....	4.00	95
123678-HxCDD	80.0	4.9	1234-TCDD-13C....	2.00	NA
123789-HxCDD	27.0	4.9	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	360.0	-----	2378-TCDD-37C14..	0.20	73
1234678-HpCDF	120.0	4.9			
1234789-HpCDF	9.3	4.9			
TOTAL HpCDF	440.0	-----			
1234678-HpCDD	1400.0	4.9			
TOTAL HpCDD	2700.0	-----			
OCDF	270.0	9.8			
OCDD	11000.0	9.8			

* Value may include contributions from other TCDF isomers.

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

1344

Report No...99-1023072

REPORT OF LABORATORY ANALYSIS

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-23
Lab Sample ID.....1609600
Filename.....S91105I
Injected By.....BAL
Total Amount Extracted...0.0165 kg
% Moisture.....38.3 %
Dry Weight Extracted.....0.0102 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91104M
Method Blank ID.....BLANK-102599

Matrix.....SOIL
Dilution.....NA
Collected...10/14/99
Received...10/19/99
Extracted...10/25/99
Analyzed....11/05/99 15:08

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	78
TOTAL TCDF	1.1	-----	2378-TCDD-13C....	2.00	80
2378-TCDD	ND	1.0	12378-PeCDF-13C..	2.00	89
TOTAL TCDD	1.6	-----	23478-PeCDF-13C..	2.00	89
12378-PeCDF	ND	4.9	12378-PeCDD-13C..	2.00	78
23478-PeCDF	ND	4.9	123478-HxCDF-13C.	2.00	94
TOTAL PeCDF	14.0	-----	123678-HxCDF-13C.	2.00	93
12378-PeCDD	ND	4.9	234678-HxCDF-13C.	2.00	92
TOTAL PeCDD	ND	-----	123789-HxCDF-13C.	2.00	94
123478-HxCDF	7.9	4.9	123478-HxCDD-13C.	2.00	90
123678-HxCDF	ND	6.3	123678-HxCDD-13C.	2.00	85
234678-HxCDF	ND	4.9	1234678-HpCDF-13C	2.00	81
123789-HxCDF	ND	4.9	1234789-HpCDF-13C	2.00	89
TOTAL HxCDF	150.0	-----	1234678-HpCDD-13C	2.00	90
123478-HxCDD	ND	4.9	OCDD-13C.....	4.00	90
123678-HxCDD	15.0	4.9	1234-TCDD-13C....	2.00	NA
123789-HxCDD	4.9	4.9	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	86.0	-----	2378-TCDD-37C14..	0.20	79
1234678-HpCDF	48.0	4.9			
1234789-HpCDF	ND	4.9			
TOTAL HpCDF	180.0	-----			
1234678-HpCDD	410.0	4.9			
TOTAL HpCDD	860.0	-----			
OCDF	120.0	9.8			
OCDD	3100.0	9.8			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1023072

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-36
Lab Sample ID.....1615904
Filename.....S91105N
Injected By.....BAL
Total Amount Extracted...0.0134 kg
% Moisture.....24.2 %
Dry Weight Extracted.....0.0102 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91105K
Method Blank ID.....BLANK-102599

Matrix.....SEDIMENT
Dilution.....NA
Collected...10/15/99
Received...10/20/99
Extracted...10/25/99
Analyzed...11/05/99 20:44

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	80
TOTAL TCDF	ND	-----	2378-TCDD-13C....	2.00	81
			12378-PeCDF-13C..	2.00	87
2378-TCDD	ND	1.0	23478-PeCDF-13C..	2.00	82
TOTAL TCDD	ND	-----	12378-PeCDD-13C..	2.00	85
			123478-HxCDF-13C.	2.00	94
12378-PeCDF	ND	4.9	123678-HxCDF-13C.	2.00	98
23478-PeCDF	ND	4.9	234678-HxCDF-13C.	2.00	95
TOTAL PeCDF	ND	-----	123789-HxCDF-13C.	2.00	104
			123478-HxCDD-13C.	2.00	84
12378-PeCDD	ND	4.9	123678-HxCDD-13C.	2.00	101
TOTAL PeCDD	ND	-----	1234678-HpCDF-13C	2.00	90
			1234789-HpCDF-13C	2.00	101
123478-HxCDF	ND	4.9	1234678-HpCDD-13C	2.00	94
123678-HxCDF	ND	4.9	OCDD-13C.....	4.00	98
234678-HxCDF	ND	4.9			
123789-HxCDF	ND	4.9	1234-TCDD-13C....	2.00	NA
TOTAL HxCDF	16.0	-----	123789-HxCDD-13C.	2.00	NA
123478-HxCDD	ND	4.9	2378-TCDD-37C14..	0.20	81
123678-HxCDD	ND	4.9			
123789-HxCDD	ND	4.9			
TOTAL HxCDD	6.4	-----			
1234678-HpCDF	8.7	4.9			
1234789-HpCDF	ND	4.9			
TOTAL HpCDF	50.0	-----			
1234678-HpCDD	71.0	4.9			
TOTAL HpCDD	140.0	-----			
OCDF	55.0	9.8			
OCDD	590.0	9.8			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

13144

Report No...99-1023380

REPORT OF LABORATORY ANALYSIS

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-38
Lab Sample ID.....1615920
Filename.....S911050
Injected By.....BAL
Total Amount Extracted...0.0110 kg
% Moisture.....6.5 %
Dry Weight Extracted.....0.0103 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91105K
Method Blank ID.....BLANK-102599

Matrix.....SEDIMENT
Dilution.....NA
Collected...10/16/99
Received....10/20/99
Extracted...10/25/99
Analyzed....11/05/99 21:45

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	59
TOTAL TCDF	1.4	-----	2378-TCDD-13C....	2.00	65
2378-TCDD	ND	1.0	12378-PeCDF-13C..	2.00	84
TOTAL TCDD	ND	-----	23478-PeCDF-13C..	2.00	83
12378-PeCDF	6.2	4.9	12378-PeCDD-13C..	2.00	86
23478-PeCDF	16.0	4.9	123478-HxCDF-13C.	2.00	91
TOTAL PeCDF	52.0	-----	123678-HxCDF-13C.	2.00	92
12378-PeCDD	11.0	4.9	234678-HxCDF-13C.	2.00	89
TOTAL PeCDD	24.0	-----	123789-HxCDF-13C.	2.00	97
123478-HxCDF	34.0	4.9	123478-HxCDD-13C.	2.00	90
123678-HxCDF	ND <i>EUS</i>	22.0	123678-HxCDD-13C.	2.00	96
234678-HxCDF	20.0	4.9	1234678-HpCDF-13C	2.00	87
123789-HxCDF	12.0	4.9	1234789-HpCDF-13C	2.00	101
TOTAL HxCDF	550.0	-----	1234678-HpCDD-13C	2.00	99
123478-HxCDD	16.0	4.9	OCDD-13C.....	4.00	111
123678-HxCDD	120.0	4.9	1234-TCDD-13C....	2.00	NA
123789-HxCDD	35.0	4.9	123789-HxCDD-13C.	2.00	NA
TOTAL HxCDD	450.0	-----	2378-TCDD-37C14..	0.20	70
1234678-HpCDF	140.0	4.9			
1234789-HpCDF	12.0	4.9			
TOTAL HpCDF	590.0	-----			
1234678-HpCDD	1700.0	4.9			
TOTAL HpCDD	3100.0	-----			
OCDF	270.0	9.7			
OCDD	12000.0	9.7			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1023380

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METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-42
Lab Sample ID.....1615995
Filename.....S91105P
Injected By.....BAL
Total Amount Extracted...0.0111 kg
% Moisture.....5.8 %
Dry Weight Extracted.....0.0105 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91105K
Method Blank ID.....BLANK-102599

Matrix.....SEDIMENT
Dilution....NA
Collected...10/18/99
Received....10/20/99
Extracted...10/25/99
Analyzed....11/05/99 22:44

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	66
TOTAL TCDF	ND	-----	2378-TCDD-13C....	2.00	71
			12378-PeCDF-13C..	2.00	77
2378-TCDD	ND	1.0	23478-PeCDF-13C..	2.00	78
TOTAL TCDD	ND	-----	12378-PeCDD-13C..	2.00	79
			123478-HxCDF-13C.	2.00	102
12378-PeCDF	ND	4.8	123678-HxCDF-13C.	2.00	100
23478-PeCDF	ND	4.8	234678-HxCDF-13C.	2.00	105
TOTAL PeCDF	5.2	-----	123789-HxCDF-13C.	2.00	104
			123478-HxCDD-13C.	2.00	97
12378-PeCDD	ND	4.8	123678-HxCDD-13C.	2.00	99
TOTAL PeCDD	ND	-----	1234678-HpCDF-13C	2.00	85
			1234789-HpCDF-13C	2.00	89
123478-HxCDF	9.4	4.8	1234678-HpCDD-13C	2.00	91
123678-HxCDF	ND	5.7	OCDD-13C.....	4.00	87
234678-HxCDF	ND	4.8			
123789-HxCDF	ND	4.8	1234-TCDD-13C....	2.00	NA
TOTAL HxCDF	130.0	-----	123789-HxCDD-13C.	2.00	NA
123478-HxCDD	ND	4.8	2378-TCDD-37Cl4..	0.20	66
123678-HxCDD	12.0	4.8			
123789-HxCDD	ND	4.8			
TOTAL HxCDD	38.0	-----			
1234678-HpCDF	45.0	4.8			
1234789-HpCDF	5.0	4.8			
TOTAL HpCDF	160.0	-----			
1234678-HpCDD	210.0	4.8			
TOTAL HpCDD	400.0	-----			
OCDF	110.0	9.6			
OCDD	1700.0	9.6			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE interference

(Handwritten signature/initials)

Report No...99-1023380

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

Pace Analytical Services, Inc.
1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612-607-6444

METHOD 1613 ANALYSIS RESULTS

Client....OREGON

Client's Sample ID.....L13502-44
Lab Sample ID.....1616001
Filename.....S91105Q
Injected By.....MCH
Total Amount Extracted...0.0115 kg
% Moisture.....10.5 %
Dry Weight Extracted.....0.0103 kg
ICAL Date.....10/14/99
CCAL Filename(s).....S91105K
Method Blank ID.....BLANK-102599

Matrix.....SEDIMENT
Dilution....NA
Collected...10/18/99
Received....10/20/99
Extracted...10/25/99
Analyzed....11/05/99 23:43

NATIVE ISOMERS	CONC ng/kg	PRL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	ND	1.0	2378-TCDF-13C....	2.00	54
TOTAL TCDF	ND	-----	2378-TCDD-13C....	2.00	60
			12378-PeCDF-13C..	2.00	71
2378-TCDD	ND	1.0	23478-PeCDF-13C..	2.00	73
TOTAL TCDD	ND	-----	12378-PeCDD-13C..	2.00	74
			123478-HxCDF-13C.	2.00	99
12378-PeCDF	ND	4.9	123678-HxCDF-13C.	2.00	95
23478-PeCDF	ND	4.9	234678-HxCDF-13C.	2.00	99
TOTAL PeCDF	6.4	-----	123789-HxCDF-13C.	2.00	98
			123478-HxCDD-13C.	2.00	97
12378-PeCDD	ND	4.9	123678-HxCDD-13C.	2.00	90
TOTAL PeCDD	ND	-----	1234678-HpCDF-13C	2.00	85
			1234789-HpCDF-13C	2.00	89
123478-HxCDF	13.0	4.9	1234678-HpCDD-13C	2.00	85
123678-HxCDF	ND	6.2	OCDD-13C.....	4.00	75
234678-HxCDF	ND	4.9			
123789-HxCDF	ND	4.9	1234-TCDD-13C....	2.00	NA
TOTAL HxCDF	77.0	-----	123789-HxCDD-13C.	2.00	NA
123478-HxCDD	ND	4.9	2378-TCDD-37C14..	0.20	56
123678-HxCDD	5.0	4.9			
123789-HxCDD	ND	4.9			
TOTAL HxCDD	23.0	-----			
1234678-HpCDF	38.0	4.9			
1234789-HpCDF	ND	4.9			
TOTAL HpCDF	140.0	-----			
1234678-HpCDD	150.0	4.9			
TOTAL HpCDD	320.0	-----			
OCDF	93.0	9.7			
OCDD	1400.0	9.7			

All values are expressed on a dry weight basis.

CONC= Concentration (Totals include 2378-substituted isomers.)
PRL = Pace Reporting Limit
ND = Not Detected
NA = Not Applicable
E = PCDE Interference

Report No...99-1023380

REPORT OF LABORATORY ANALYSIS

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Seattle 1172 North Creek Pkwy N, Suite 400, Bothell, WA 98011-8223

425.420.9200 fax 425.420.9210

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509.924.9200 fax 509.924.9290

Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132

503.906.9200 fax 503.906.9210

Bend 20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711

541.383.9310 fax 541.382.7588

Grain Size

*(Subcontracted to Rosa Environmental
and Geotechnical Laboratory)*

January 25, 2000

Ms. Crystal Burkholder
North Creek Analytical
9405 SW Nimbus Ave.
Beaverton, OR 97008

Subject: P1A0246 REGL Project No.: 1052-011

Dear Ms. Burkholder,

On January 11, 2001 we received 30 samples for grain size analysis. The test results are on the following pages. A narrative is included that describes the samples and methods.

Please call me to discuss any questions, or comments you may have on the data or its presentation.

Best Regards,
Rosa Environmental & Geotechnical Laboratory, LLC.

for Harold Benny
Harold Benny
Laboratory Manager

Client: North Creek Analytical

REGL Project No.: 1052-011

Client Project No.: P1A0246

Sample Batch No.: 1052-011-01 & 02

Case Narrative

1. Thirty samples were received on January 11, 2001, and they were in good condition.
2. Hydrometer analysis was performed according to ASTM D-422.
3. Two samples were chosen for a triplicate on each set of fifteen samples. P1A0246-13 was chosen for batch one and P1A0246-29 was chosen for batch two. Included is a QA summary of both triplicates.
4. Sample P1A0246-01 had what appeared to be rounded volcanic glass (i.e. black and shiny appearance).
5. Wood was found in several samples; P1A0246-02, -07, -09, -13, -14, -20, -24, -26, -28, and -30.
6. Sample P1A0246-12 had several rocks stuck together by what appeared to be cement.
7. There were no other anomalies to the samples or testing.

Released by:

Sharon L. Davis
Title: Laboratory Lead

Date:

1/25/01

Approved by:

for Harold Benny
Title: Laboratory Manager

Date:

1/25/01

North Creek Analytical
P1A0246

Percent Finer (Passing) Than the Indicated Size																		
Sieve Size (microns)	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (125)	#200 (75)	32	22	13	9	7	3.2	1.3
P1A0246-13 A	100.0	100.0	100.0	100.0	99.8	96.6	94.7	93.4	92.1	91.4	89.0	76.1	68.7	52.9	45.5	35.3	23.2	16.7
P1A0246-13 B	100.0	100.0	100.0	100.0	99.9	96.3	92.4	90.6	89.4	88.6	85.9	74.7	67.3	52.6	42.4	34.1	21.2	15.7
P1A0246-13 C	100.0	100.0	100.0	100.0	99.8	96.3	93.5	91.4	90.1	89.3	86.5	71.1	62.1	50.4	43.2	33.3	22.5	14.4
P1A0246-01	100.0	79.9	74.2	74.2	68.8	62.7	59.6	57.4	50.1	45.5	42.8	34.7	29.0	20.7	17.6	12.9	8.3	5.2
P1A0246-02	100.0	92.9	87.9	84.3	79.0	72.1	70.9	68.4	45.0	10.1	2.7	3.1	3.1	3.6	2.6	2.1	3.6	2.6
P1A0246-03	100.0	100.0	100.0	100.0	99.8	99.8	99.8	99.4	99.1	98.6	93.0	71.2	59.9	37.4	35.6	28.1	19.7	15.0
P1A0246-04	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	99.1	98.4	91.4	68.7	56.4	42.3	35.3	28.2	19.4	12.3
P1A0246-05	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	99.0	98.3	92.1	69.0	54.3	38.8	31.9	25.9	17.2	8.6
P1A0246-06	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.1	97.4	94.8	82.7	55.4	49.7	35.3	30.6	24.8	15.3	8.6
P1A0246-07	100.0	100.0	100.0	100.0	98.4	96.2	91.0	88.6	87.3	86.3	82.8	73.8	63.7	53.7	46.1	37.7	26.0	18.4
P1A0246-08	100.0	100.0	100.0	100.0	95.4	89.4	84.8	50.7	14.6	7.4	5.7	3.9	3.3	3.3	2.6	2.6	2.0	2.6
P1A0246-09	100.0	100.0	100.0	100.0	99.0	96.9	94.5	74.4	56.6	52.7	50.2	40.7	35.6	24.6	19.5	14.4	9.3	8.5
P1A0246-10	100.0	100.0	100.0	100.0	100.0	99.4	97.3	70.6	16.7	5.7	4.1	0.7	0.7	0.0	0.0	-0.7	-0.7	1.4
P1A0246-11	100.0	100.0	100.0	100.0	100.0	99.3	97.7	57.3	13.7	9.3	5.1	1.4	1.4	2.8	2.8	2.8	2.8	2.1
P1A0246-12	79.3	66.6	62.5	49.0	33.6	27.9	25.8	23.7	19.9	18.7	17.8	16.6	14.4	11.9	9.0	6.7	3.1	1.8
P1A0246-14	100.0	100.0	100.0	100.0	99.5	99.4	98.6	66.5	20.7	14.2	8.9	7.1	6.4	6.4	5.7	5.7	2.1	1.4
P1A0246-15	100.0	100.0	100.0	100.0	94.1	90.4	90.2	87.9	36.4	10.8	7.8	6.6	6.6	5.3	3.9	3.3	1.3	1.3
P1A0246-16	100.0	100.0	100.0	100.0	98.3	97.7	97.4	59.1	8.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
P1A0246-17	100.0	92.7	83.8	82.2	64.5	50.8	47.1	29.4	9.4	4.6	3.2	2.2	1.5	1.5	1.1	0.7	0.0	0.0

Testing performed according to ASTM D421/D422

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY

North Creek Analytical
P1A0246

Percent Retained in Each Size Fraction

Sample No.	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Sand	% Silt	% Clay
Size (microns)	> 4750	4750-2000	2000-425	425-75	4750-75	75-3	<3
P1A0246-13 A	0.2	3.2	3.2	4.4	10.7	65.8	23.2
P1A0246-13 B	0.1	3.5	5.7	4.7	13.9	64.7	21.2
P1A0246-13 C	0.2	3.5	4.9	5.0	13.4	63.9	22.5
P1A0246-01	31.2	6.2	5.3	14.6	26.1	34.5	8.3
P1A0246-02	21.0	6.9	3.7	65.7	76.3	-0.9	3.6
P1A0246-03	0.2	0.0	0.4	6.3	6.8	73.4	19.7
P1A0246-04	0.0	0.0	0.5	8.0	8.6	72.0	19.4
P1A0246-05	0.0	0.0	0.6	7.3	7.9	74.8	17.2
P1A0246-06	0.0	0.1	0.9	16.4	17.3	67.4	15.3
P1A0246-07	1.6	2.1	7.7	5.8	15.6	56.8	26.0
P1A0246-08	4.6	6.0	38.6	45.1	89.7	3.7	2.0
P1A0246-09	1.0	2.1	22.6	24.2	48.8	40.9	9.3
P1A0246-10	0.0	0.6	28.8	66.5	95.9	4.8	-0.7
P1A0246-11	0.0	0.7	42.0	52.2	94.9	2.3	2.8
P1A0246-12	66.4	5.6	4.3	5.9	15.8	14.6	3.1
P1A0246-14	0.5	0.1	32.9	57.6	90.6	6.8	2.1
P1A0246-15	5.9	3.8	2.5	80.1	86.3	6.5	1.3
P1A0246-16	1.7	0.6	38.6	59.1	98.3	0.0	0.0
P1A0246-17	35.5	13.7	21.3	26.2	61.3	3.2	0.0

1052-011

PROJECT:	North Creek Analytical	Project No.:	P1A0246
Client Triplicate Sample ID:	P1A0246-13	Batch No.:	1052-011 -01

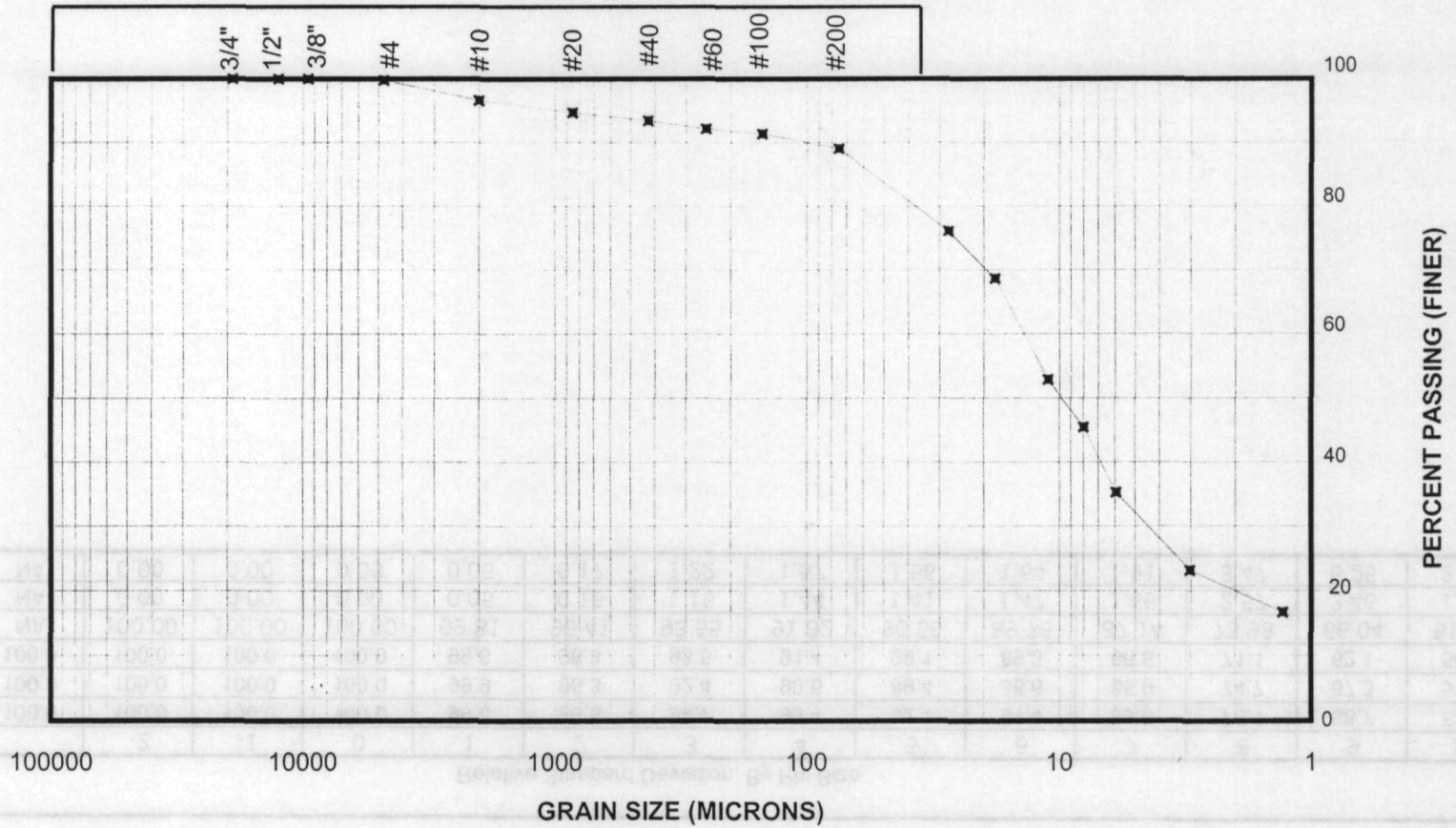
Relative Standard Deviation, By Phi Size

Sample ID		.2	.1	0	1	2	3	4	5	6	7	8	9	10
P1A0246-13 A	100.0	100.0	100.0	100.0	99.8	96.6	94.7	93.4	92.1	91.4	89.0	76.1	68.7	52.9
P1A0246-13 B	100.0	100.0	100.0	100.0	99.9	96.3	92.4	90.6	89.4	88.6	85.9	74.7	67.3	52.6
P1A0246-13 C	100.0	100.0	100.0	100.0	99.8	96.3	93.5	91.4	90.1	89.3	86.5	71.1	62.1	50.4
AVE	NA	100.00	100.00	100.00	99.81	96.41	93.55	91.82	90.56	89.76	87.14	73.98	66.04	51.96
STDEV	NA	0.00	0.00	0.00	0.05	0.16	1.15	1.44	1.41	1.47	1.66	2.57	3.46	1.35
%RSD	NA	0.00	0.00	0.00	0.05	0.17	1.22	1.57	1.56	1.64	1.91	3.47	5.25	2.60

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-13 A

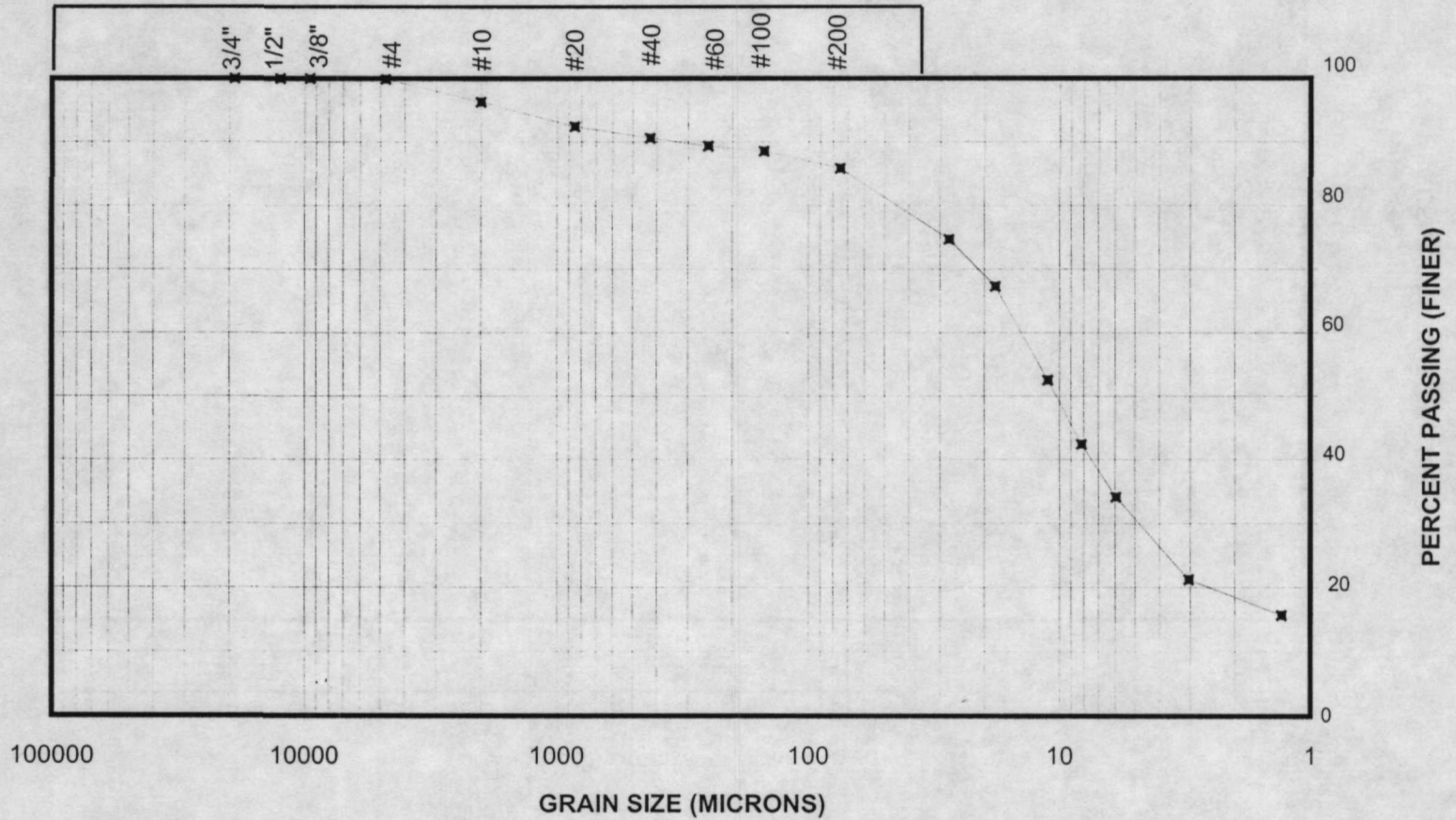


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-13 B

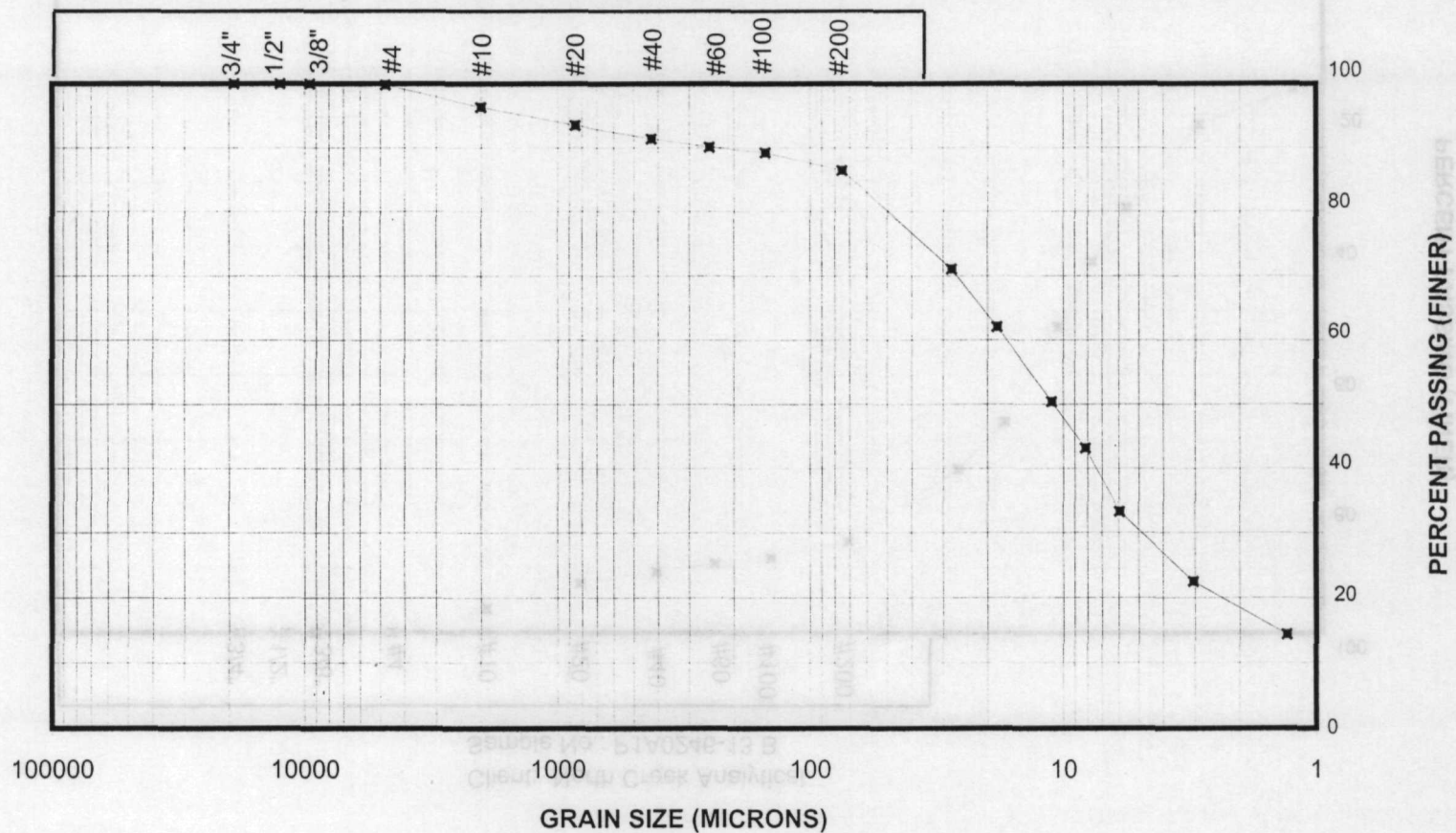


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-13 C

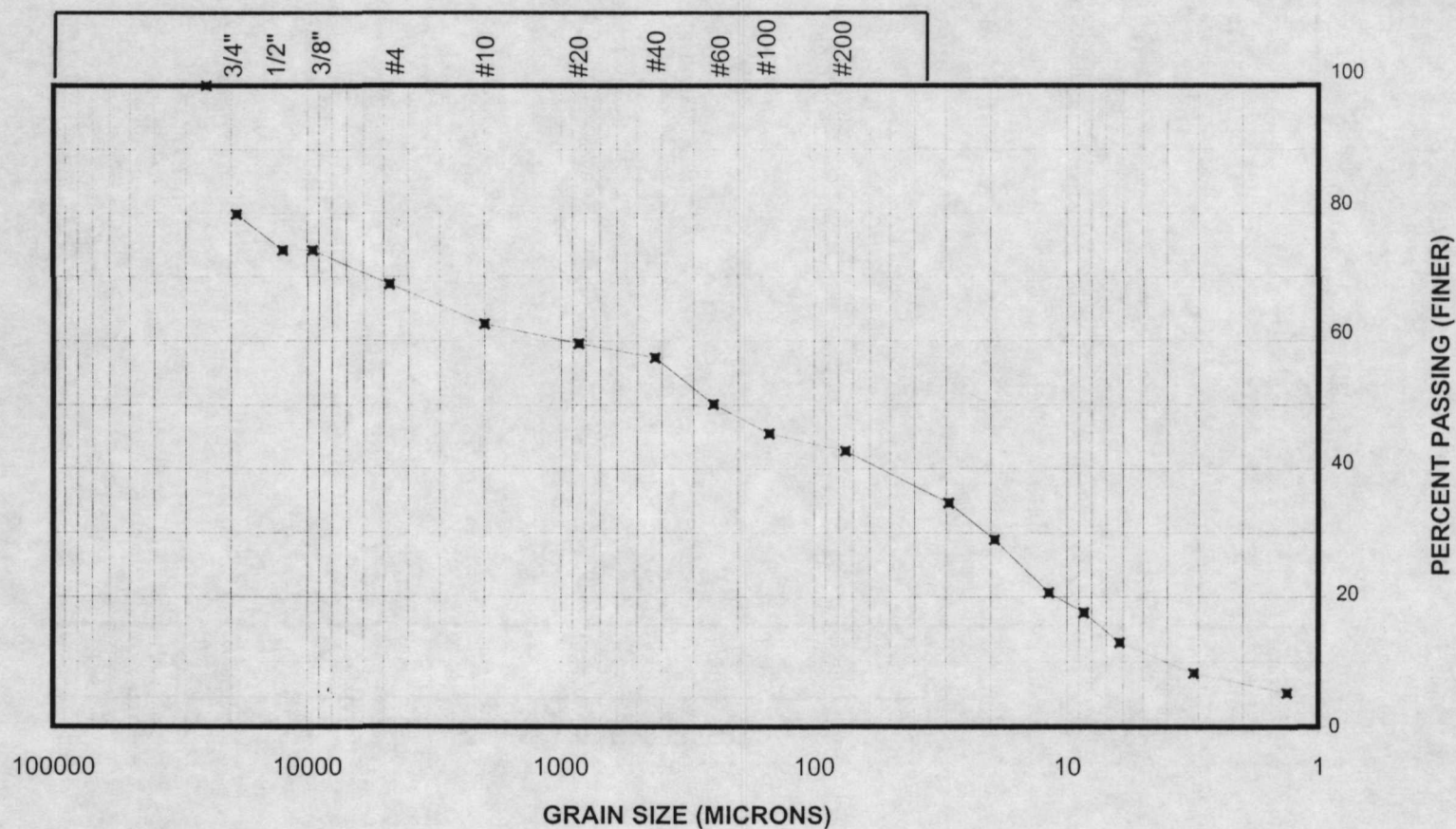


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-01



1052-011

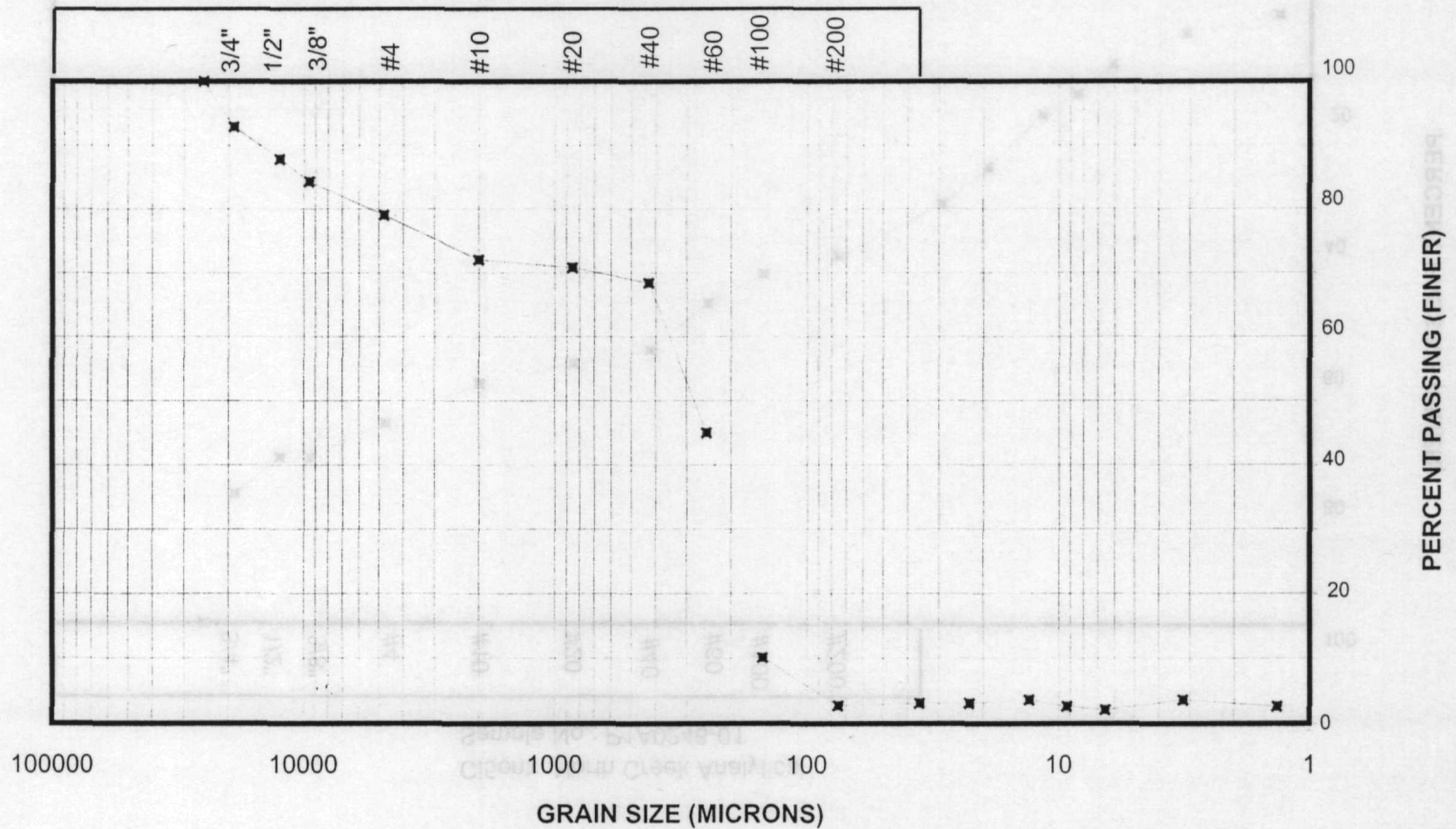
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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-02



1052-011

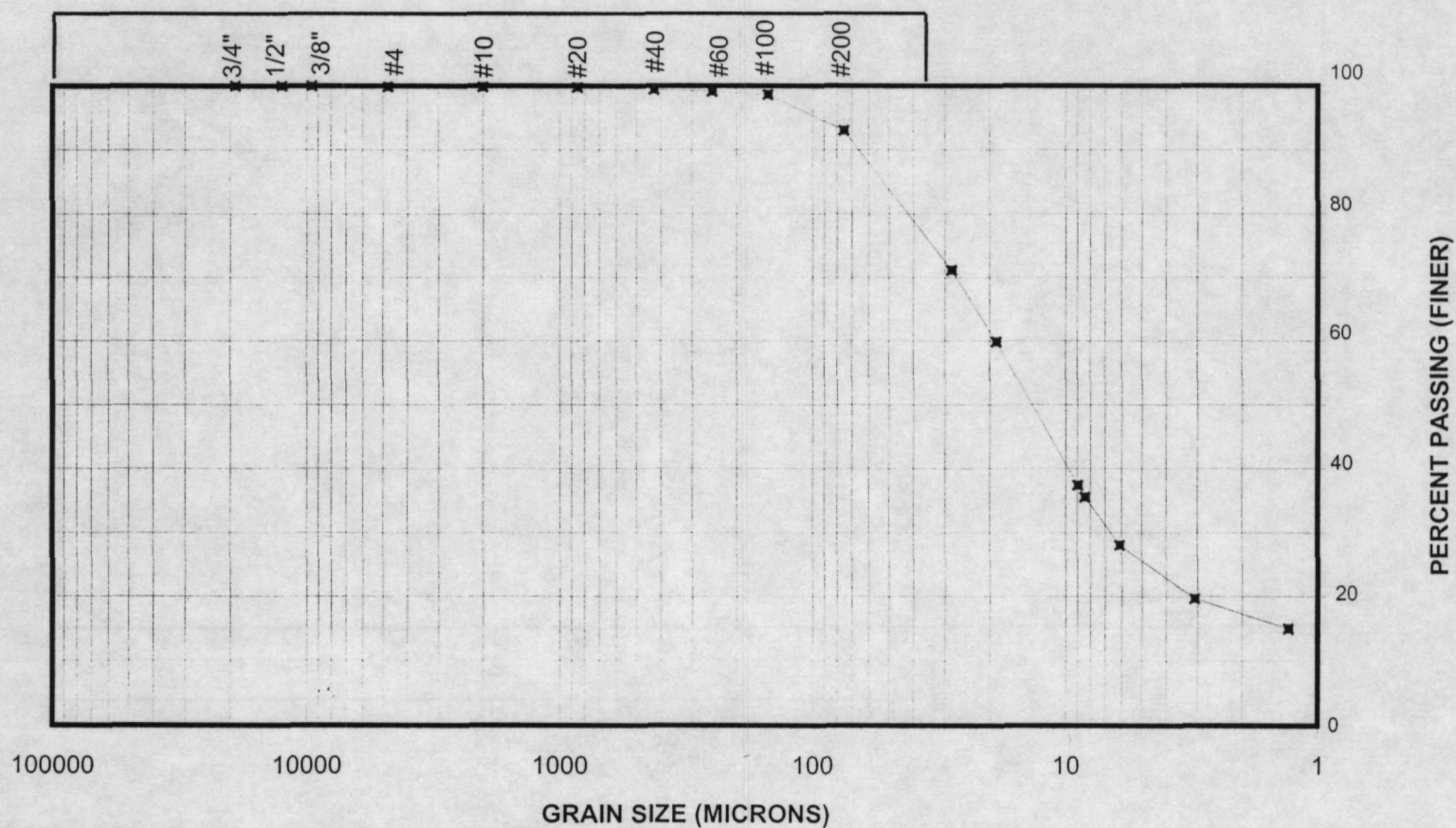
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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-03

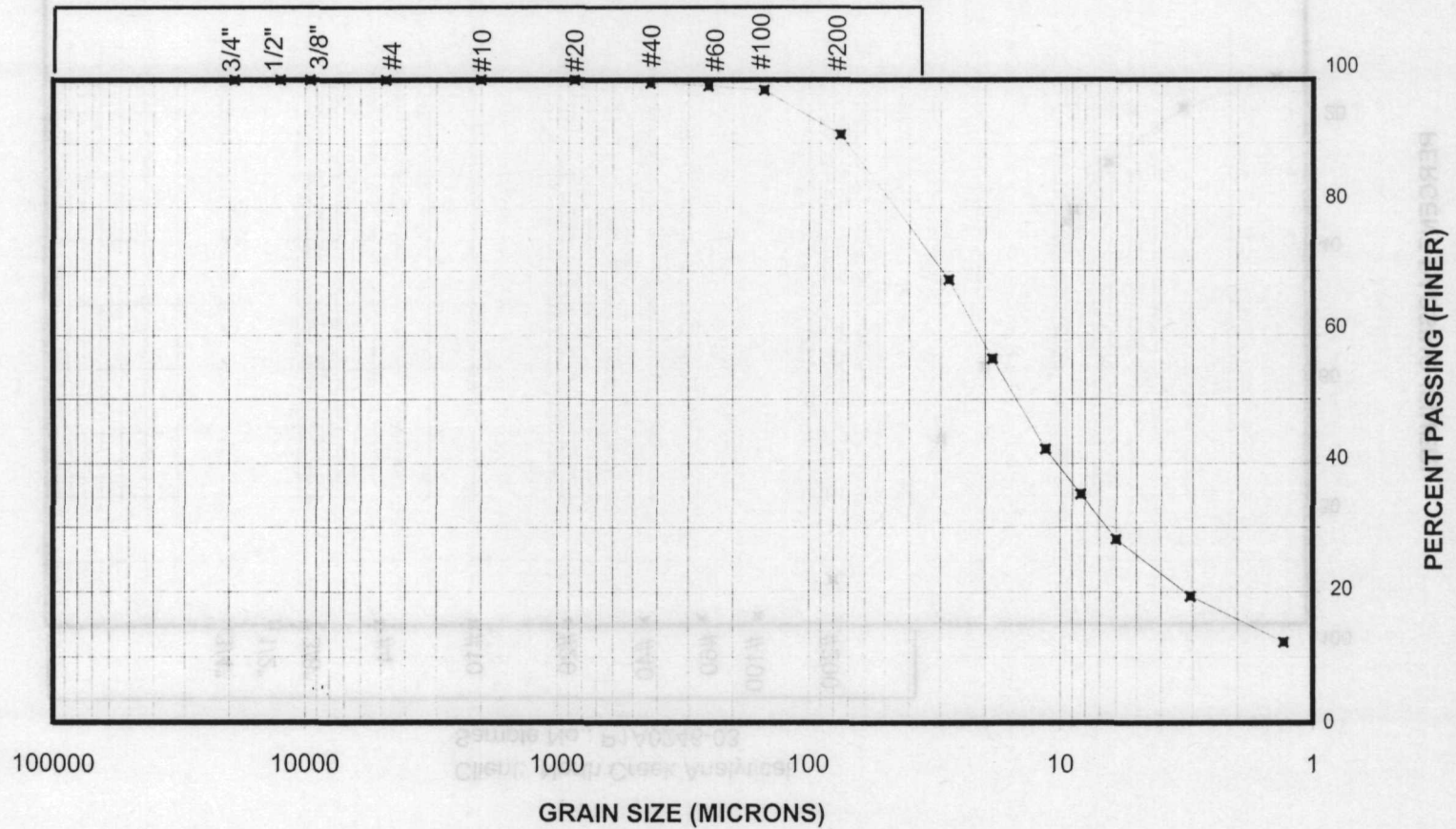


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-04



1052-011

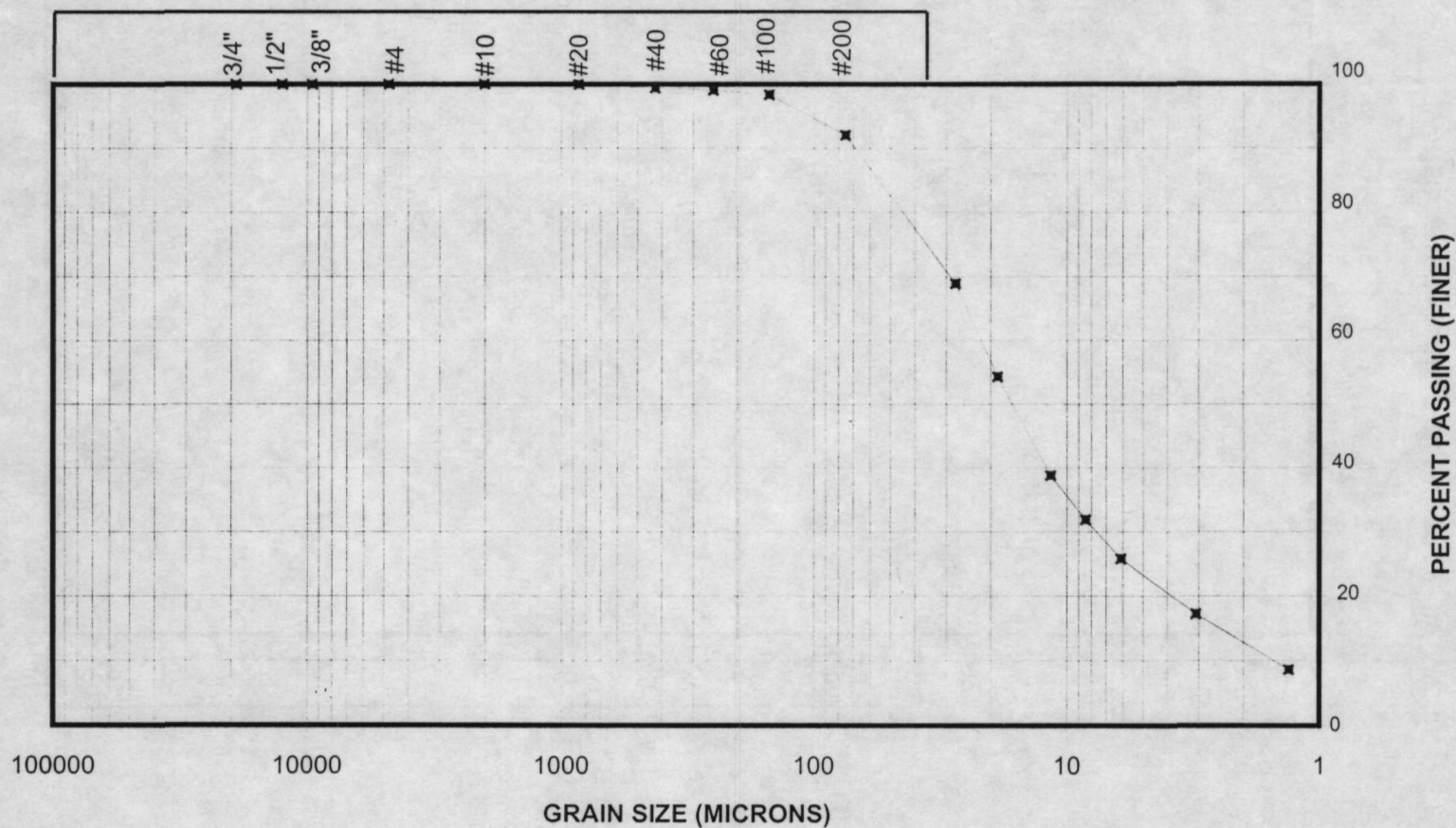
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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-05

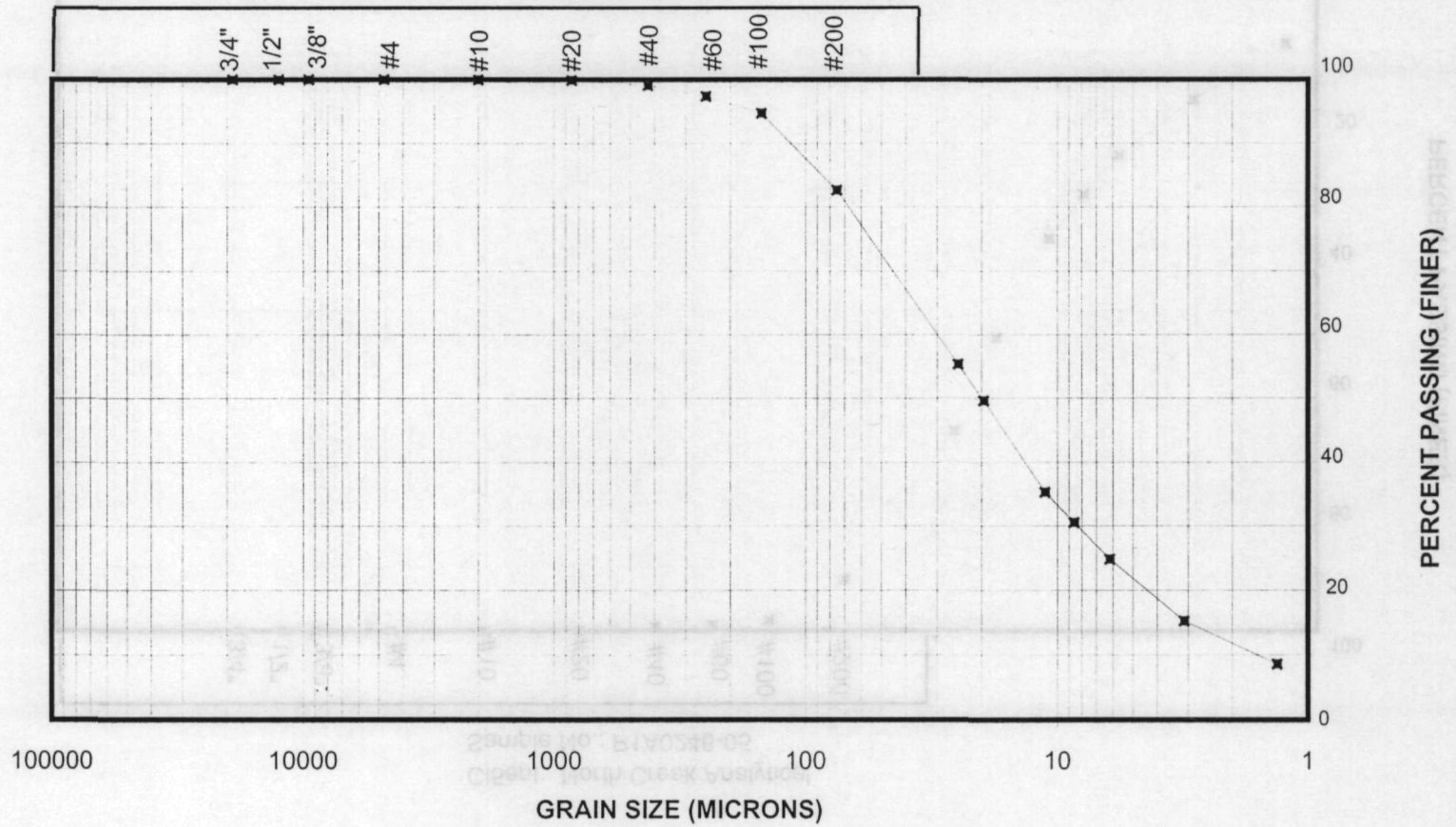


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-06



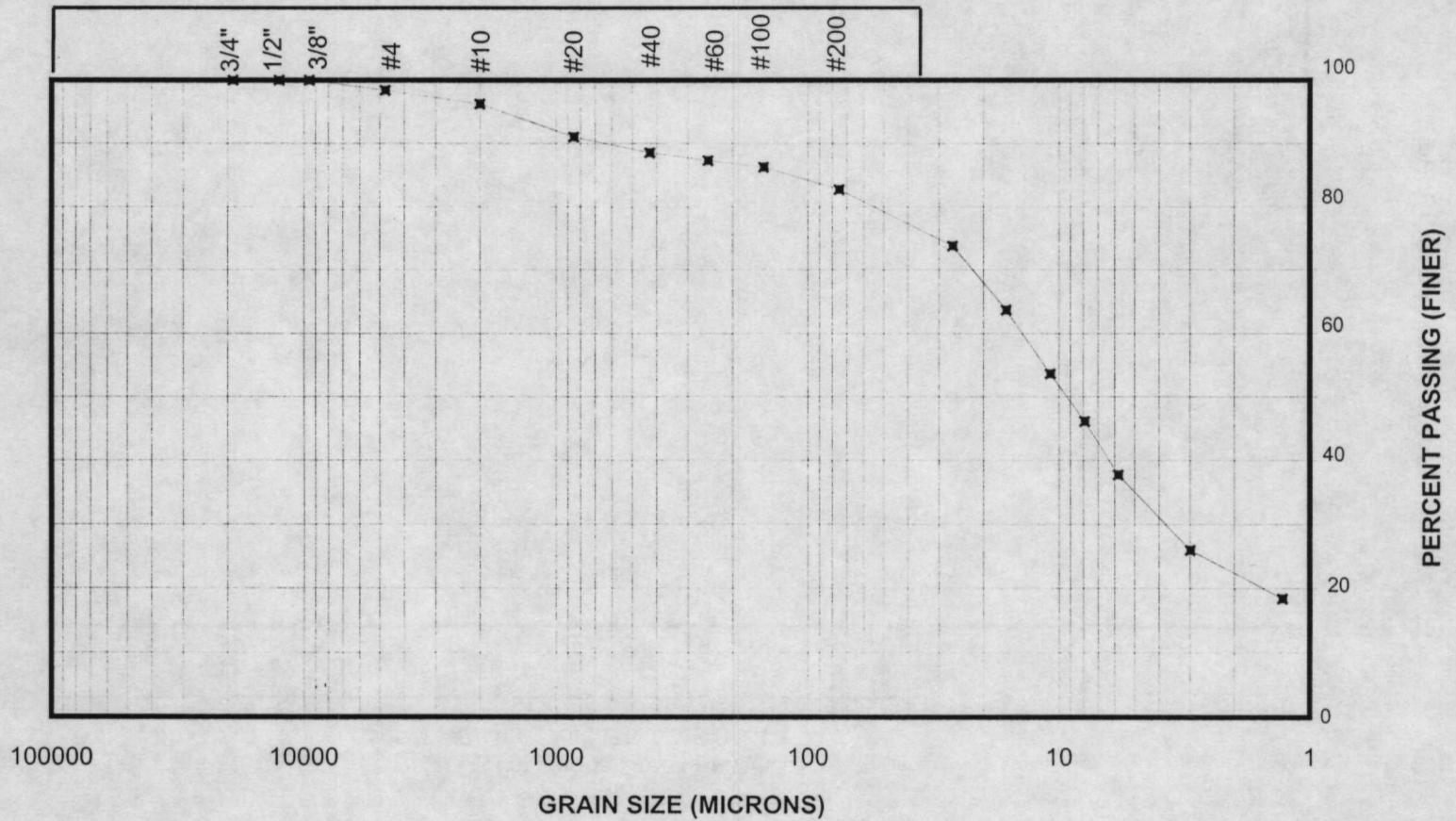
1052-011

606

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-07

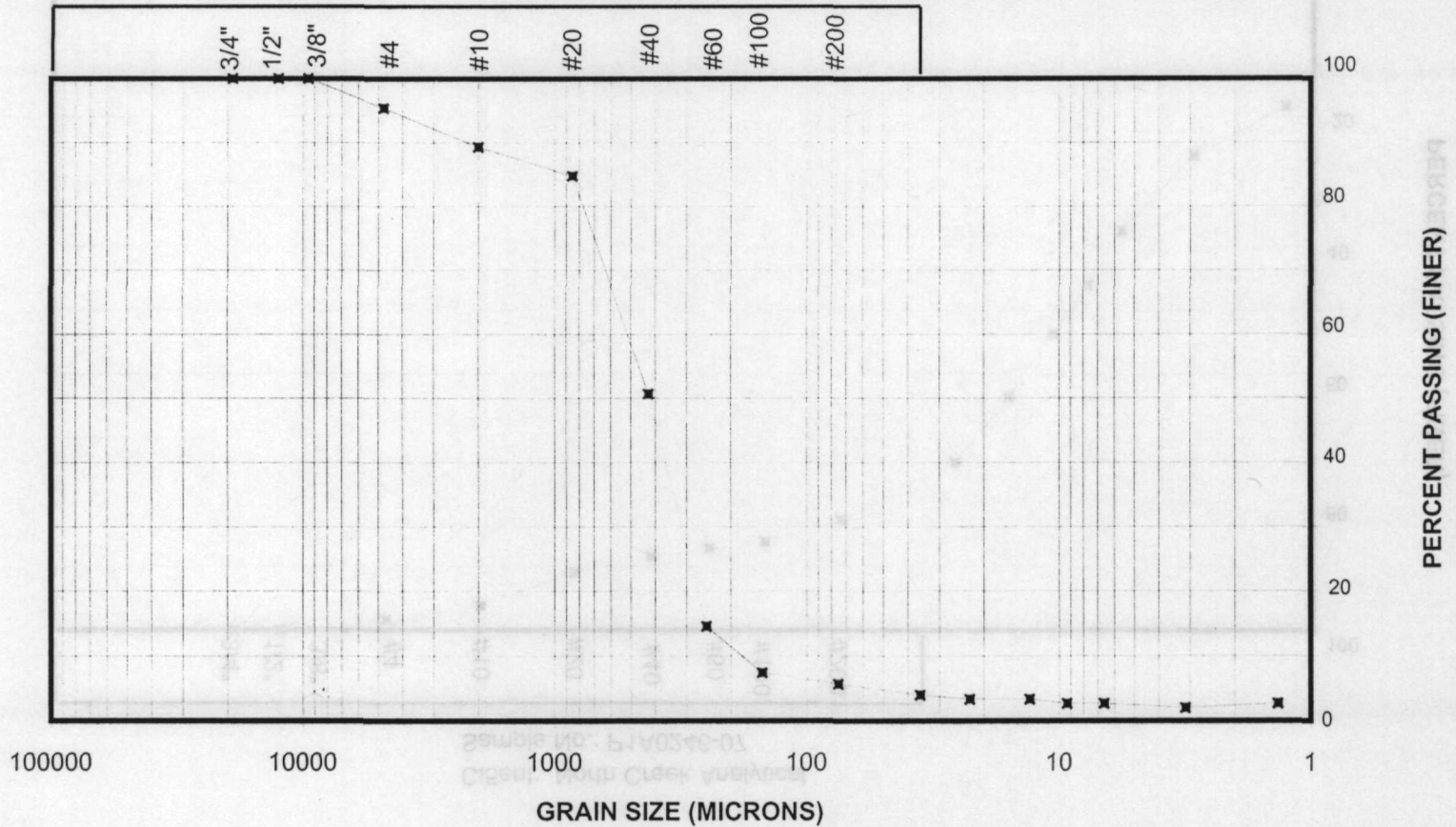


1052-011

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-08

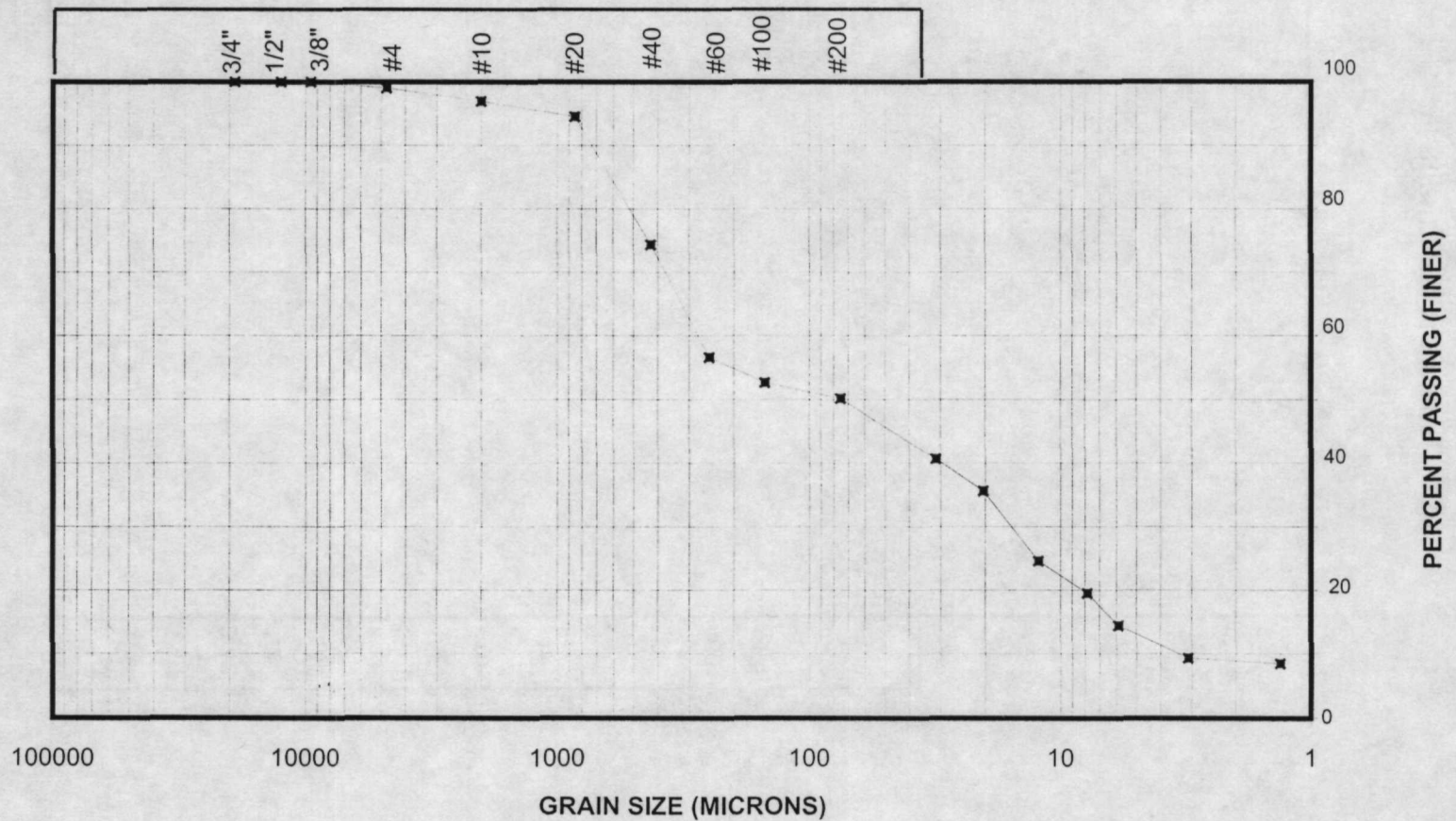


1052-011

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-09



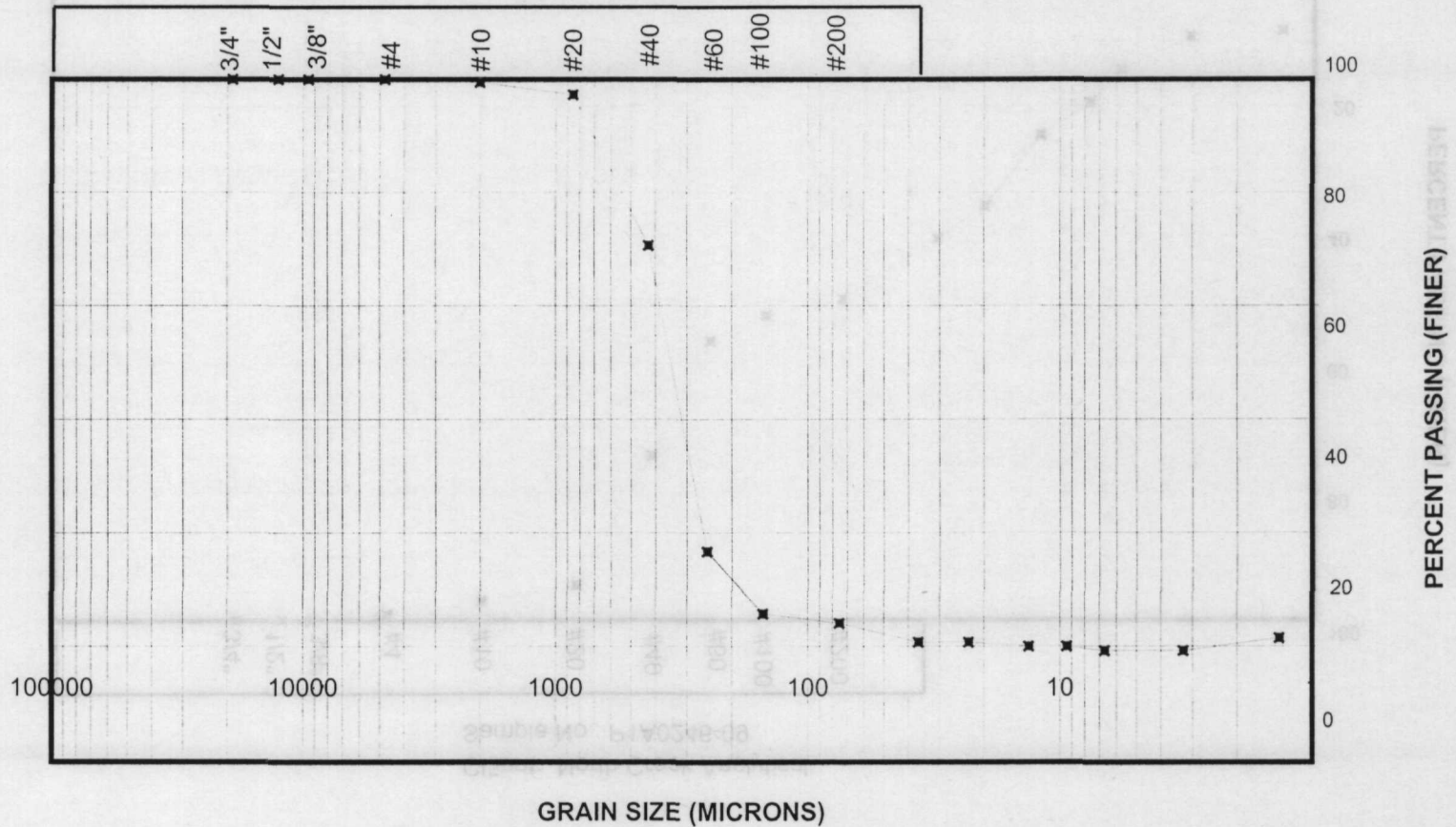
1052-011

60J

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-10



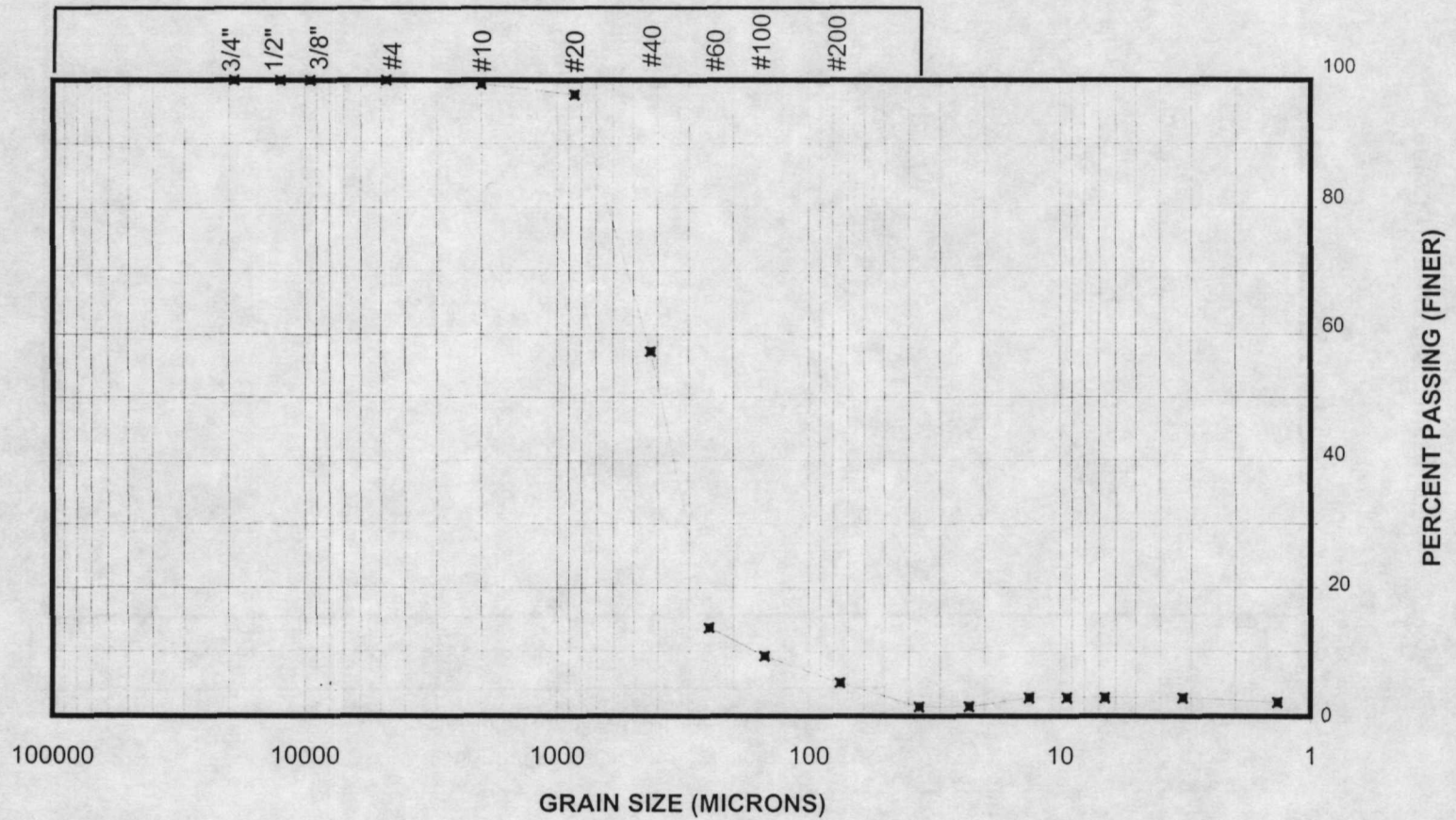
1052-011

60 K

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-11

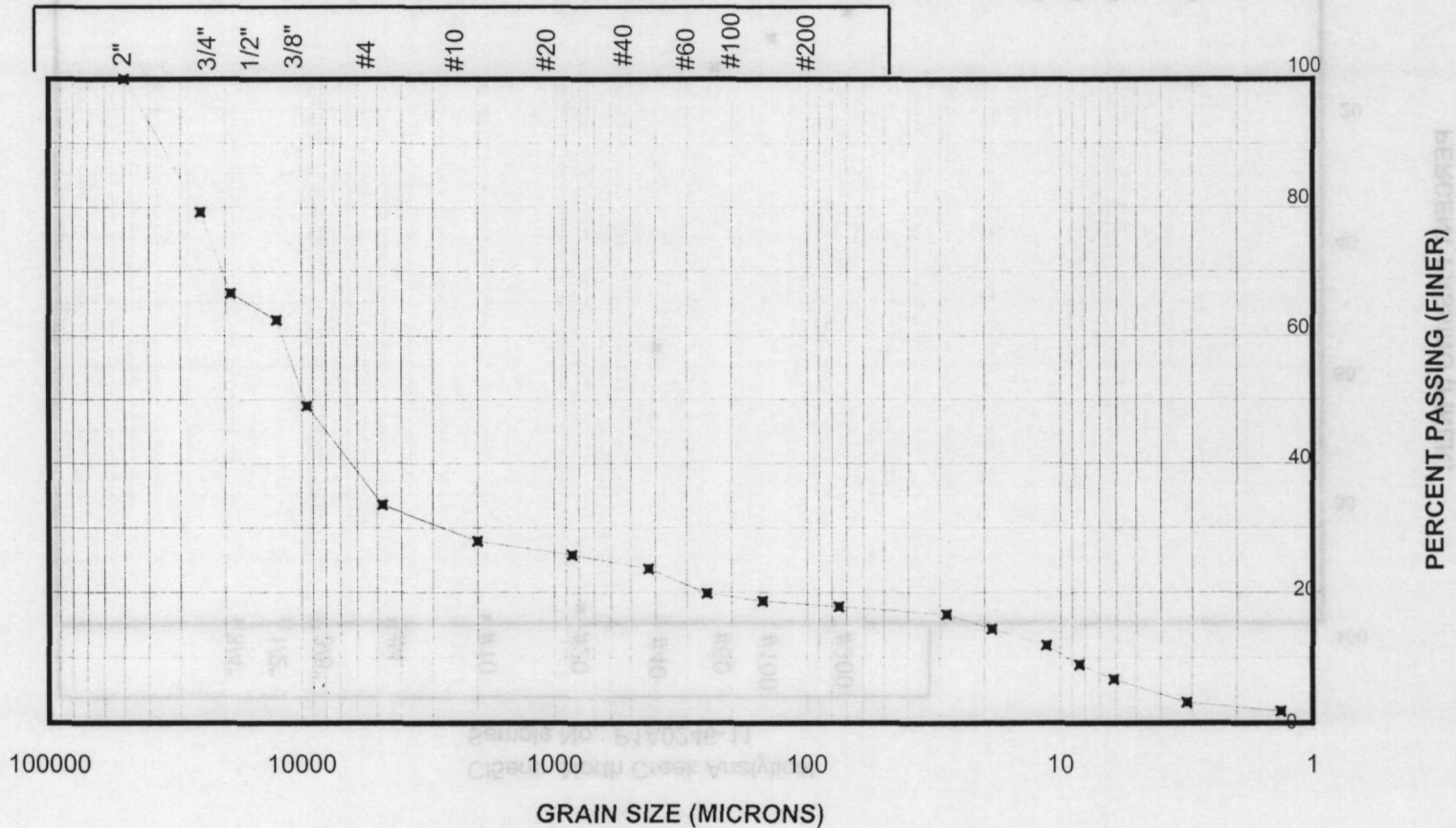


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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-02



1052-011

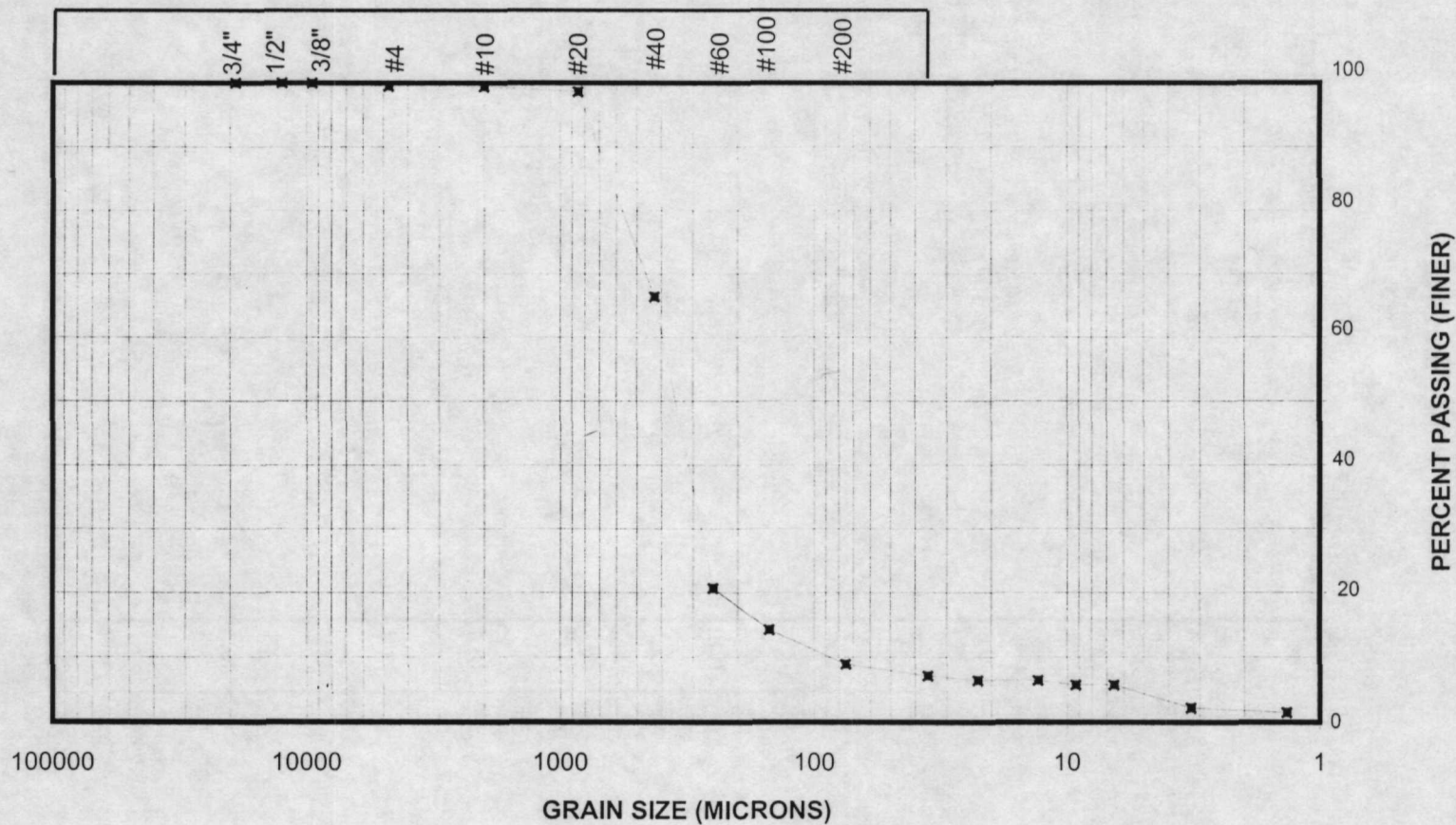
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ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-14



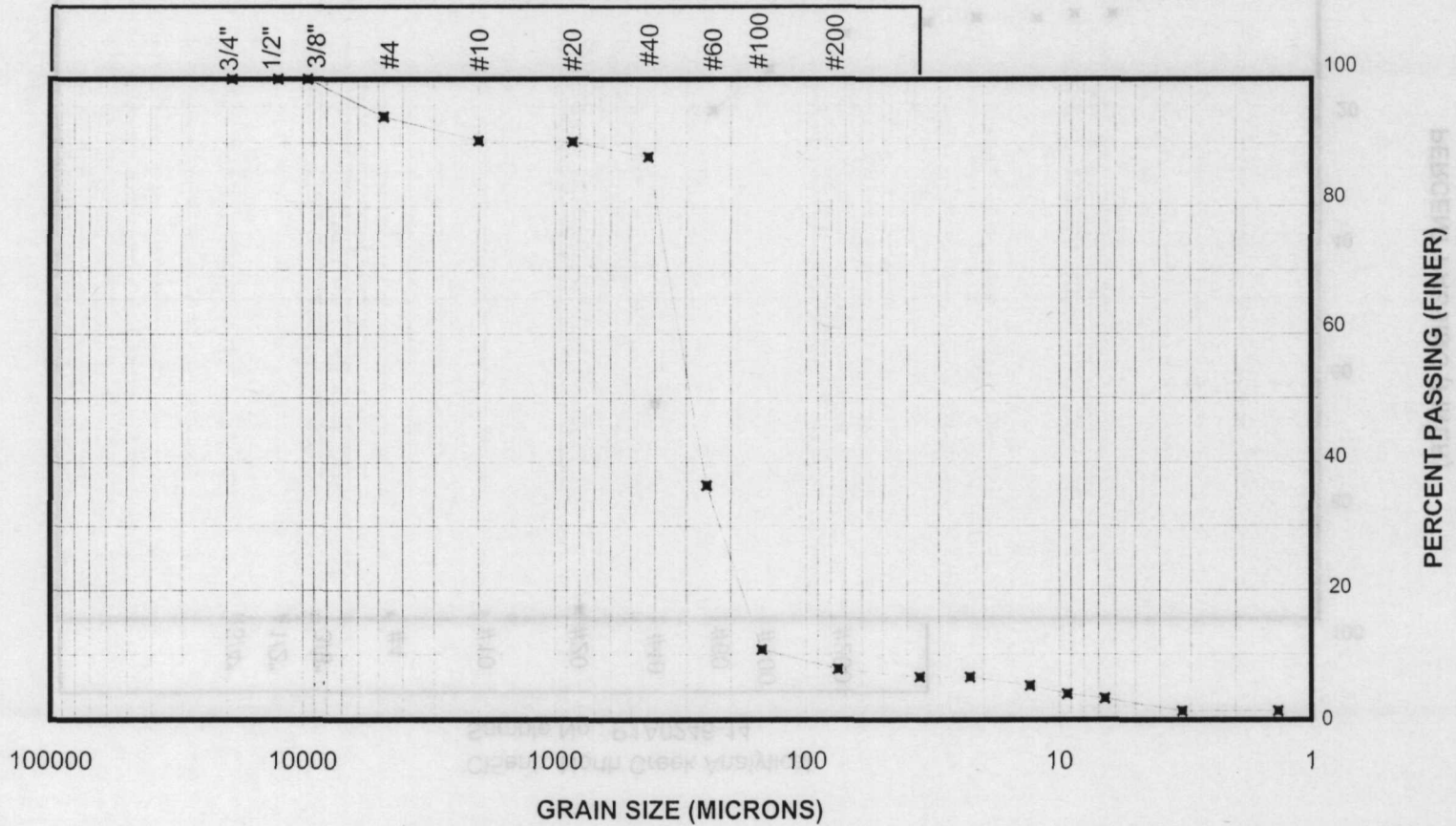
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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-15



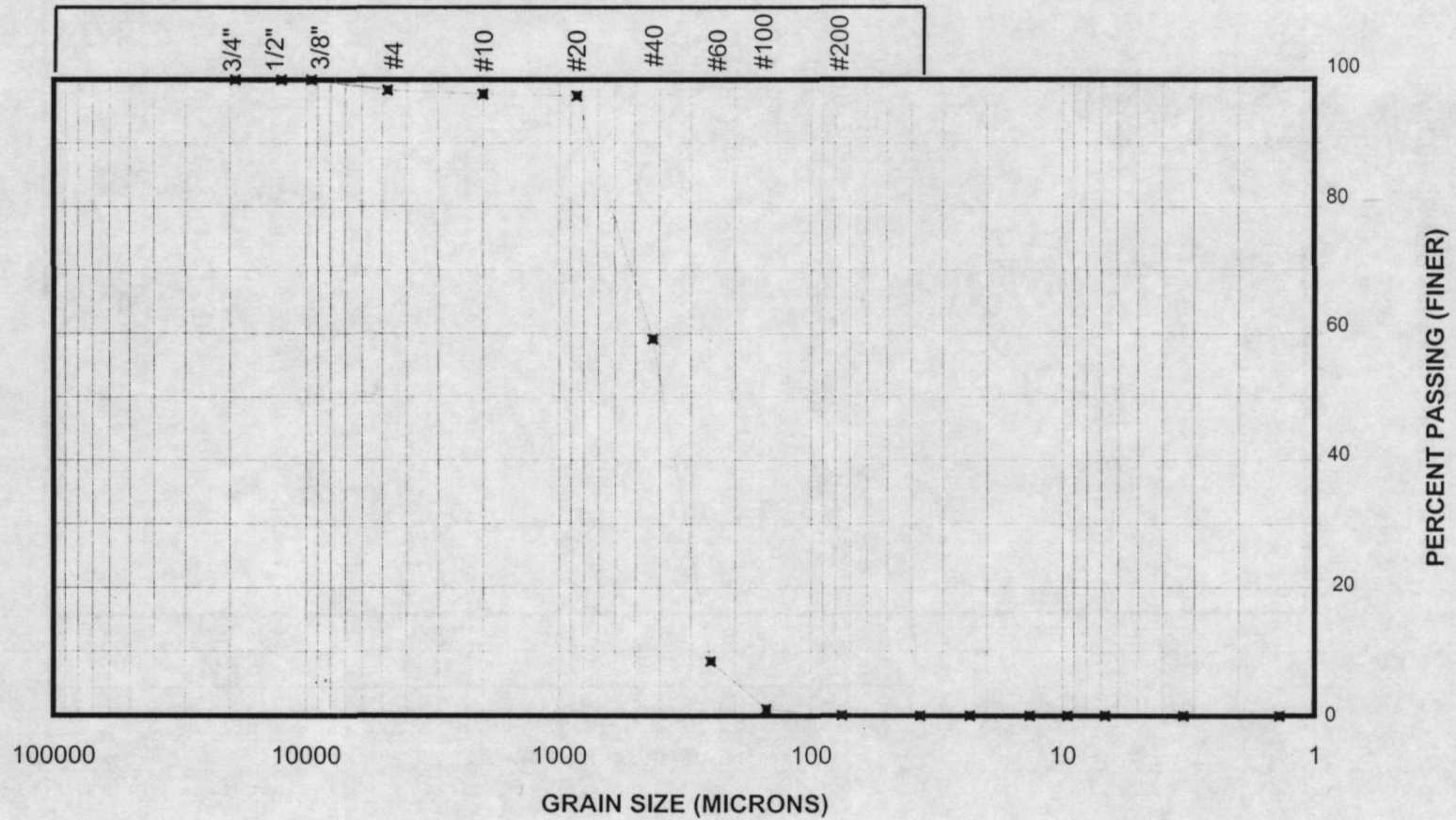
1052-011

600

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-16



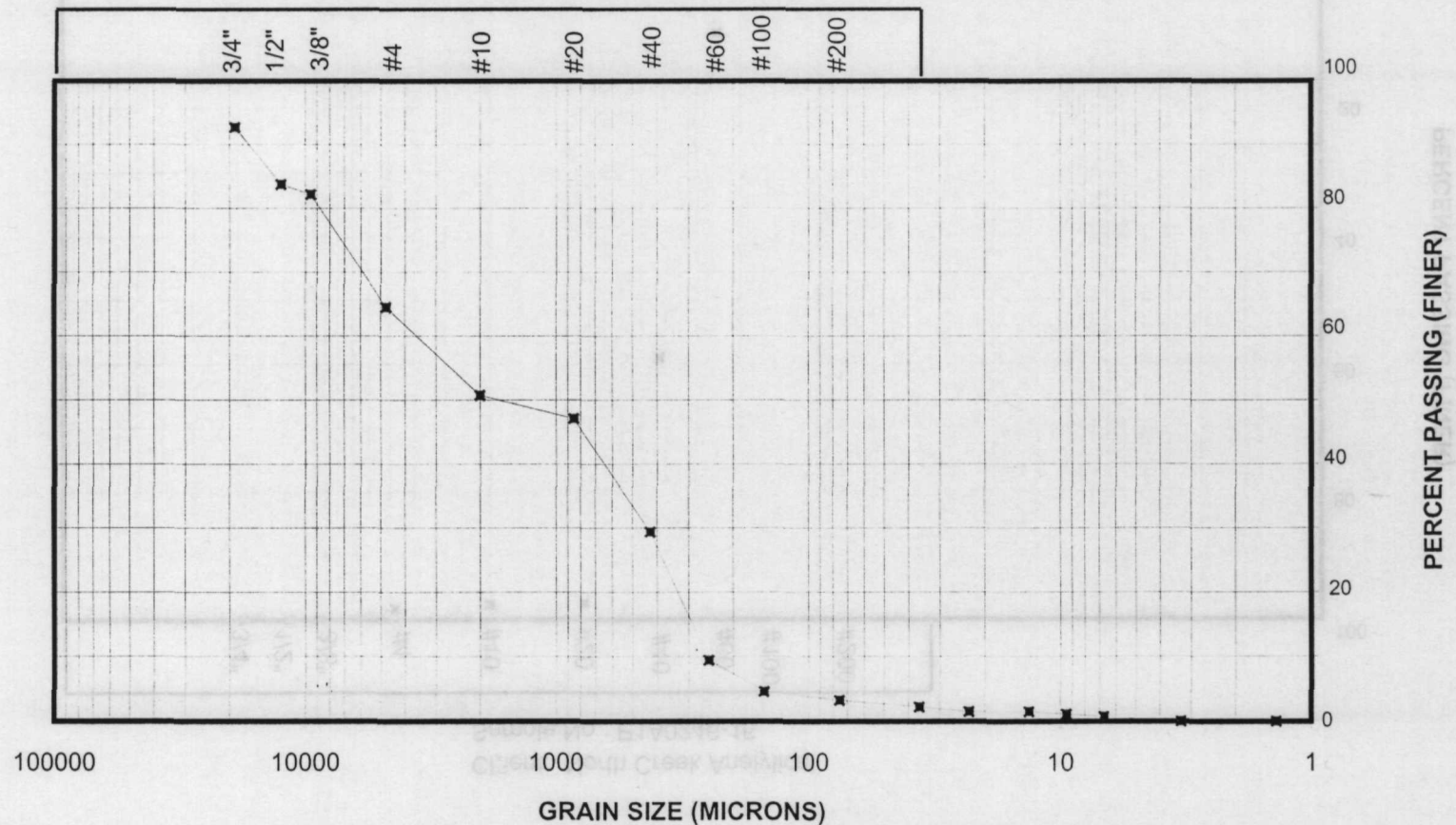
1052-011

CC 60P

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-17



1052-011

600 600

North Creek Analytical
P1A0246

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (125)	#200 (75)	32	22	13	9	7	3.2	1.3
P1A0246-29 A	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.3	98.8	98.0	93.3	65.6	53.2	37.3	28.4	22.2	14.2	8.0
P1A0246-29 B	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.4	98.9	98.1	93.0	66.7	52.2	37.7	29.0	23.2	13.5	8.7
P1A0246-29 C	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	99.1	98.4	93.7	65.5	52.1	36.6	27.0	21.2	13.5	7.7
P1A0246-18	100.0	100.0	100.0	100.0	97.3	95.6	95.2	93.9	91.7	89.7	79.7	54.0	43.5	32.3	27.0	21.0	14.3	9.0
P1A0246-19	100.0	100.0	100.0	100.0	100.0	99.0	98.6	82.2	27.9	17.4	15.2	11.6	8.7	7.3	5.8	5.1	2.9	1.5
P1A0246-20	100.0	100.0	100.0	100.0	99.5	98.8	98.4	97.2	95.2	93.0	74.7	46.4	38.1	29.8	26.5	21.5	14.9	9.1
P1A0246-21	100.0	100.0	100.0	100.0	95.6	91.2	89.6	64.0	24.5	16.7	11.8	7.2	5.3	4.6	4.0	2.6	1.3	1.3
P1A0246-22	100.0	100.0	100.0	100.0	98.9	98.4	97.7	85.0	46.6	29.0	22.2	15.8	12.6	10.3	8.7	6.3	3.2	2.4
P1A0246-23	100.0	100.0	100.0	100.0	100.0	99.7	99.5	97.7	94.9	92.3	76.9	52.4	40.7	31.0	25.2	21.3	13.6	9.7
P1A0246-24	100.0	100.0	100.0	100.0	99.8	98.7	97.8	82.6	53.6	42.7	34.1	21.9	17.4	14.3	11.3	7.5	6.0	3.8
P1A0246-25	100.0	100.0	100.0	94.9	94.4	91.0	89.1	71.8	38.3	31.9	21.4	11.8	9.6	6.6	5.2	3.7	2.2	2.2
P1A0246-26	100.0	100.0	100.0	100.0	99.7	97.8	96.4	88.6	82.6	79.2	65.6	41.3	33.2	25.2	20.1	18.1	9.1	8.1
P1A0246-27	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.5	99.1	97.6	79.7	48.0	36.7	25.4	19.8	18.8	12.2	9.4
P1A0246-28	100.0	100.0	100.0	100.0	99.8	99.7	99.5	99.1	98.6	98.0	91.2	64.8	49.4	37.7	28.1	26.1	15.5	11.6
P1A0246-30	100.0	100.0	100.0	100.0	99.9	99.4	99.1	97.6	75.6	39.7	21.0	12.3	10.8	7.9	7.9	7.9	3.6	3.6

Testing performed according to ASTM D421/D422

1052-011

602

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY

North Creek Analytical
P1A0246

Percent Retained in Each Size Fraction

Sample No.	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Sand	% Silt	% Clay
Size (microns)	> 4750	4750-2000	2000-425	425-75	4750-75	75-3	<3
P1A0246-29 A	0.0	0.1	0.6	6.0	6.7	79.1	14.2
P1A0246-29 B	0.0	0.1	0.5	6.4	7.0	79.5	13.5
P1A0246-29 C	0.0	0.0	0.4	5.8	6.3	80.2	13.5
P1A0246-18	2.7	1.7	1.8	14.1	17.6	65.5	14.3
P1A0246-19	0.0	1.0	16.8	67.0	84.8	12.3	2.9
P1A0246-20	0.5	0.7	1.7	22.4	24.8	59.8	14.9
P1A0246-21	4.4	4.3	27.2	52.2	83.8	10.4	1.3
P1A0246-22	1.1	0.6	13.4	62.7	76.7	19.1	3.2
P1A0246-23	0.0	0.3	2.0	20.8	23.1	63.3	13.6
P1A0246-24	0.2	1.2	16.1	48.5	65.7	28.1	6.0
P1A0246-25	5.6	3.5	19.2	50.3	73.0	19.2	2.2
P1A0246-26	0.3	1.9	9.2	23.0	34.0	56.6	9.1
P1A0246-27	0.0	0.1	0.4	19.8	20.3	67.5	12.2
P1A0246-28	0.2	0.2	0.6	7.9	8.6	75.7	15.5
P1A0246-30	0.1	0.5	1.8	76.6	78.9	17.4	3.6

1052-011

0000 605

QA Summary

PROJECT:	North Creek Analytical	Project No.:	P1A0246
Client Triplicate Sample ID:	P1A0246-29	Batch No.:	1052-011 -02

60T

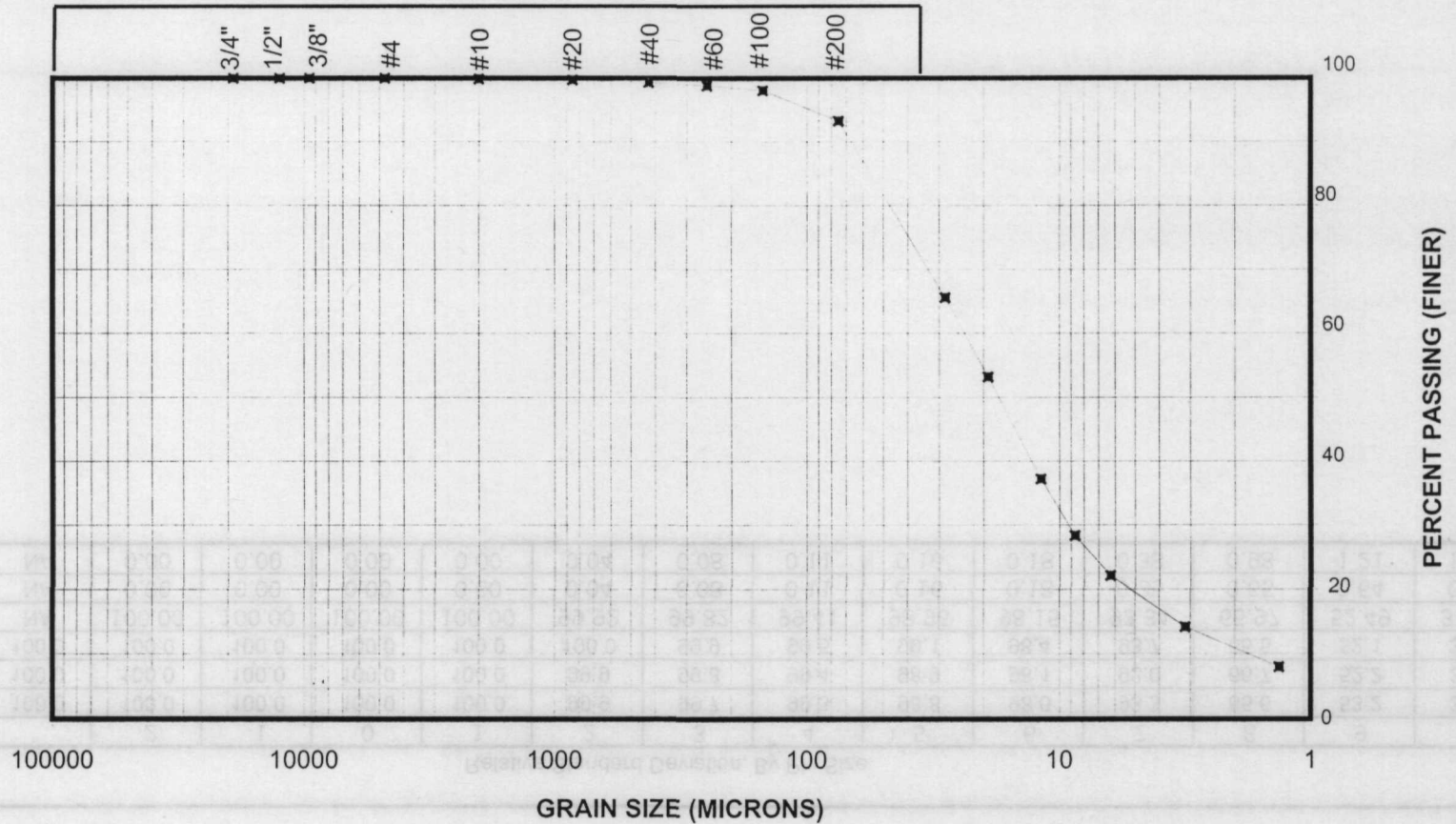
Relative Standard Deviation, By Phi Size

Sample ID		-2	-1	0	1	2	3	4	5	6	7	8	9	10
P1A0246-29 A	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.3	98.8	98.0	93.3	65.6	53.2	37.3
P1A0246-29 B	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.4	98.9	98.1	93.0	66.7	52.2	37.7
P1A0246-29 C	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	99.1	98.4	93.7	65.5	52.1	36.6
AVE	NA	100.00	100.00	100.00	100.00	99.92	99.82	99.41	98.96	98.15	93.34	65.97	52.49	37.20
STDEV	NA	0.00	0.00	0.00	0.00	0.04	0.08	0.11	0.16	0.18	0.35	0.65	0.64	0.54
%RSD	NA	0.00	0.00	0.00	0.00	0.04	0.08	0.11	0.16	0.18	0.38	0.98	1.21	1.45

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-29A



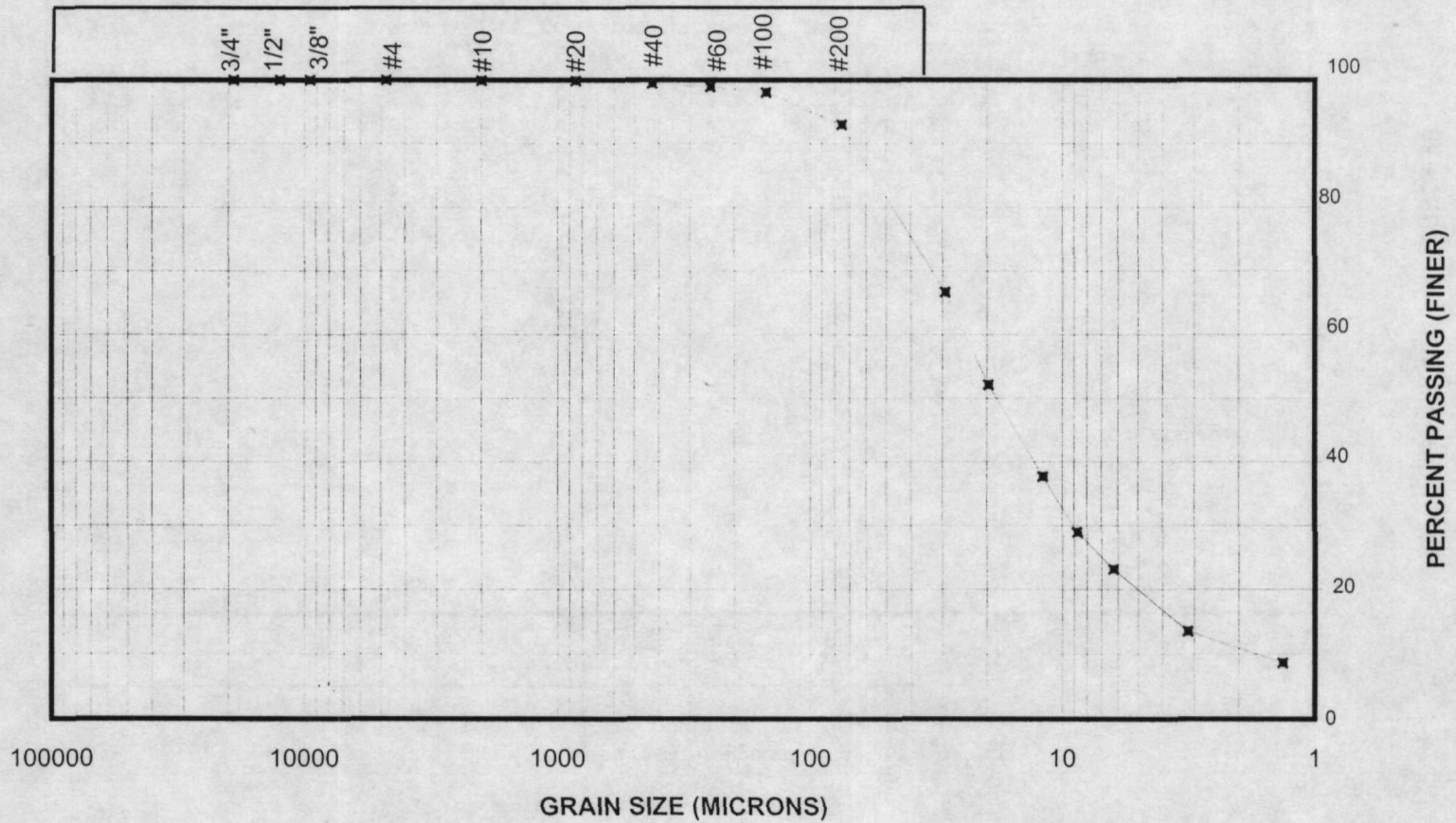
1052-011

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60

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-29B



1052-011

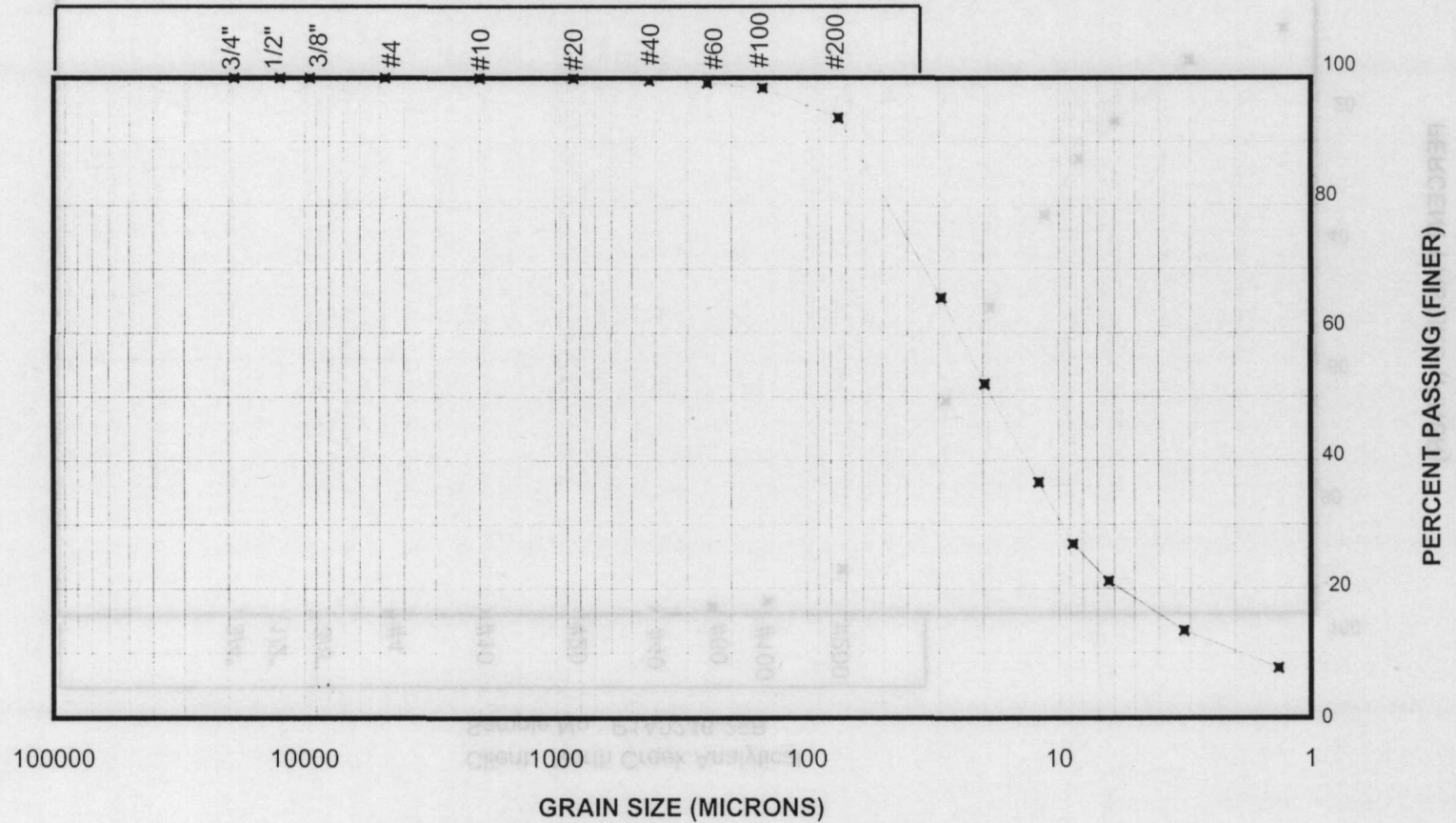
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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-29C



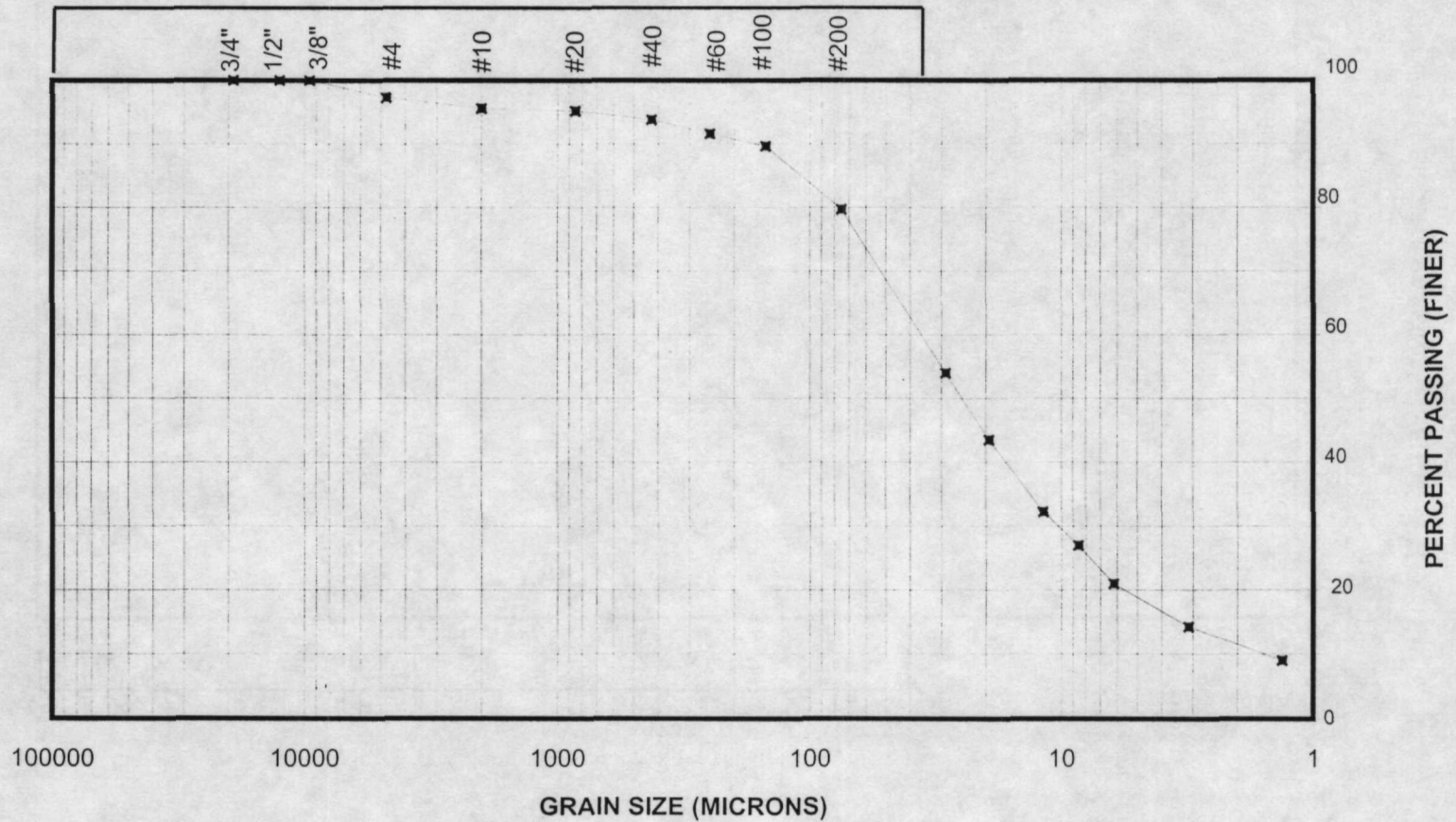
1052-011

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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-18



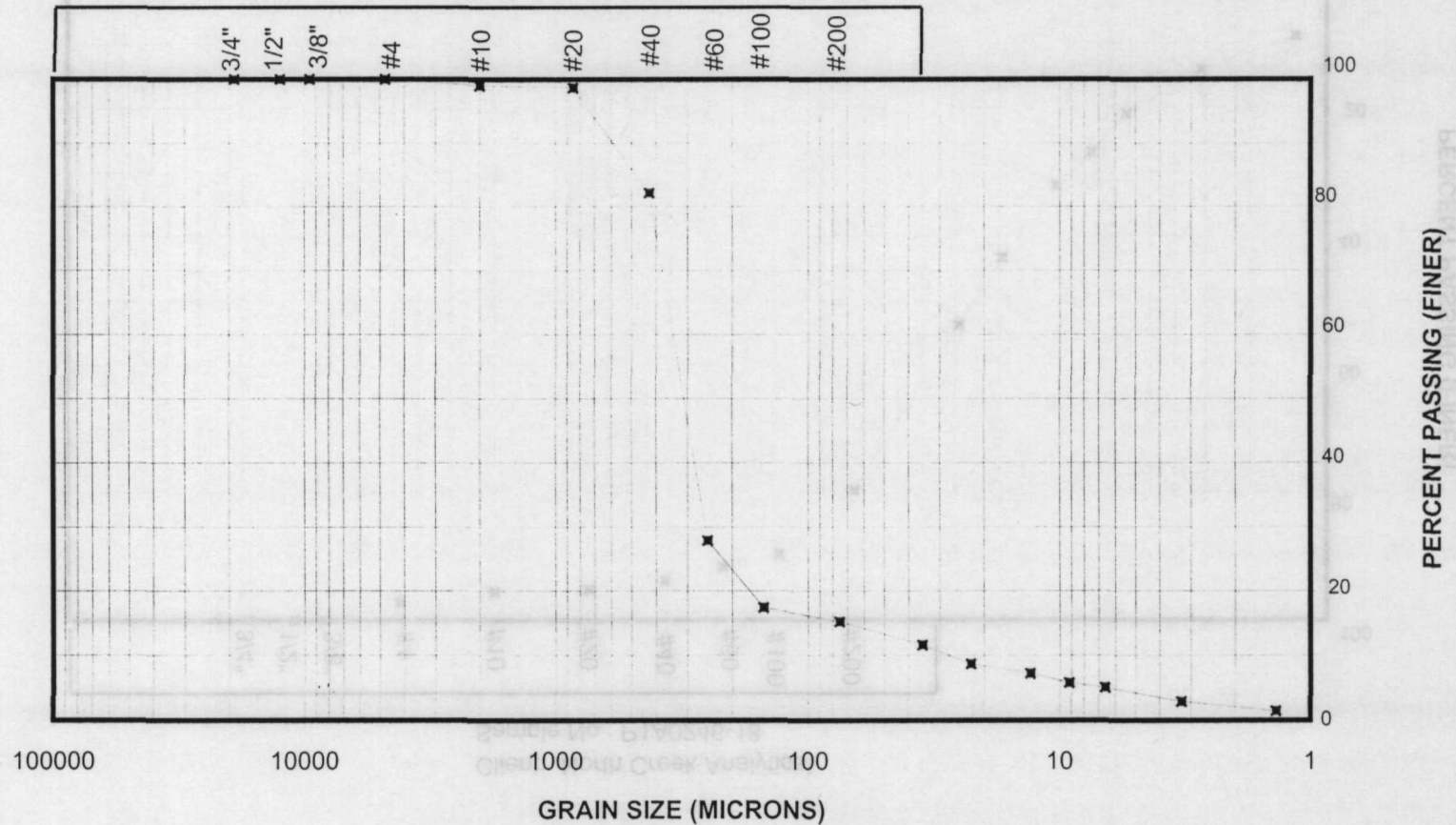
1052-011

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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-19



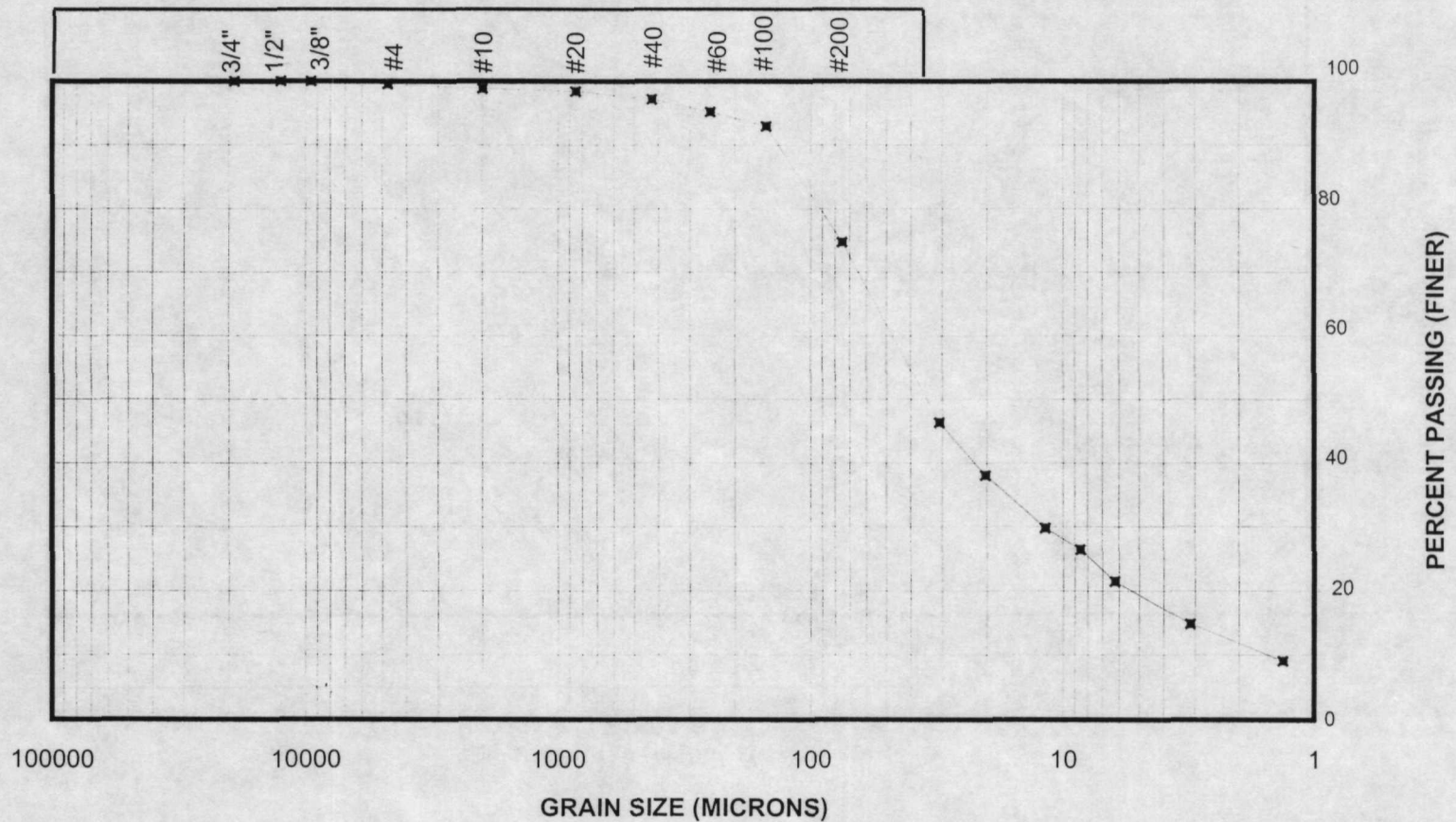
1052-011

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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-20



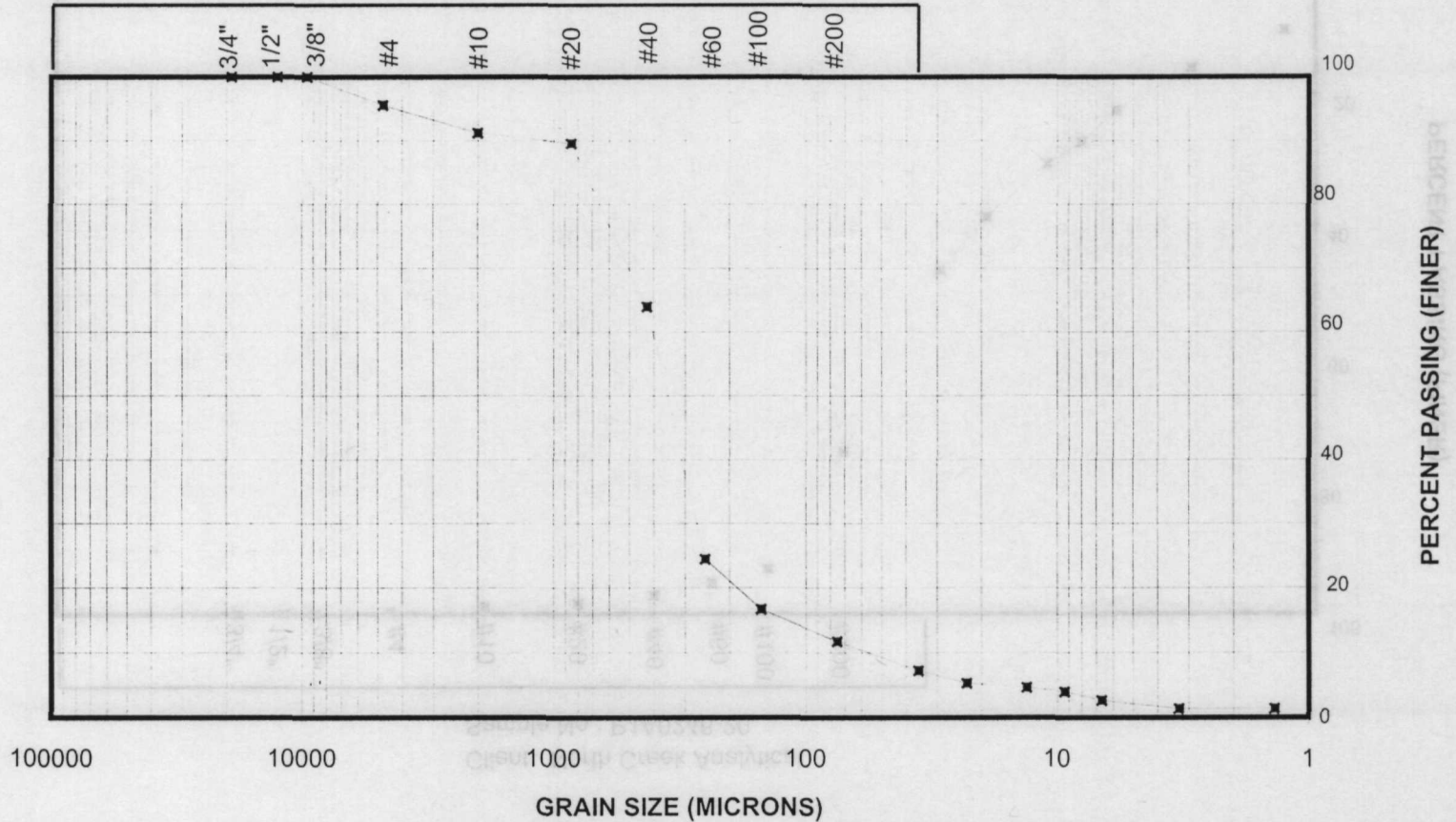
1052-011

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-21



1052-011

60AA

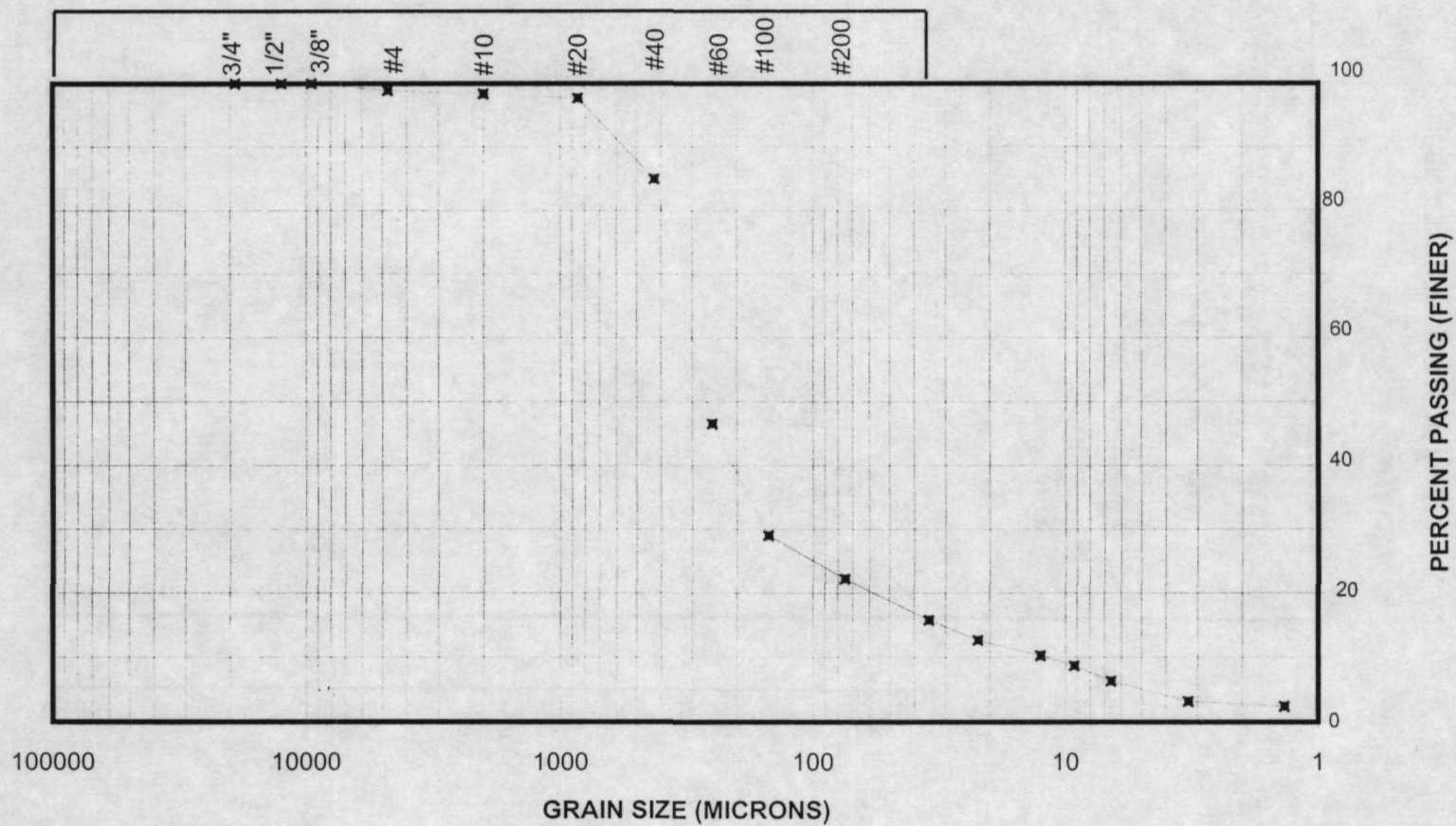
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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-22

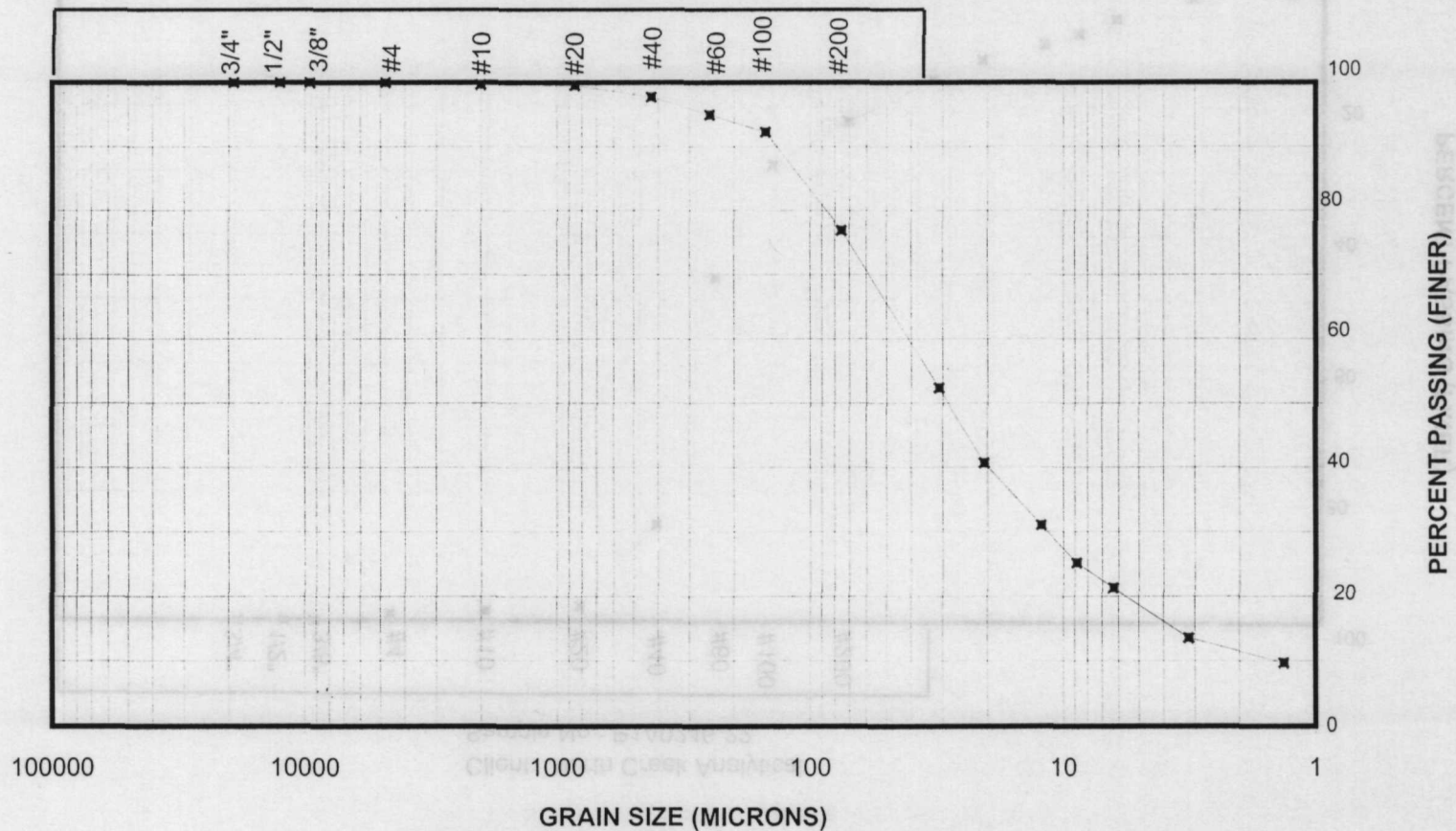


1052-011

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-23



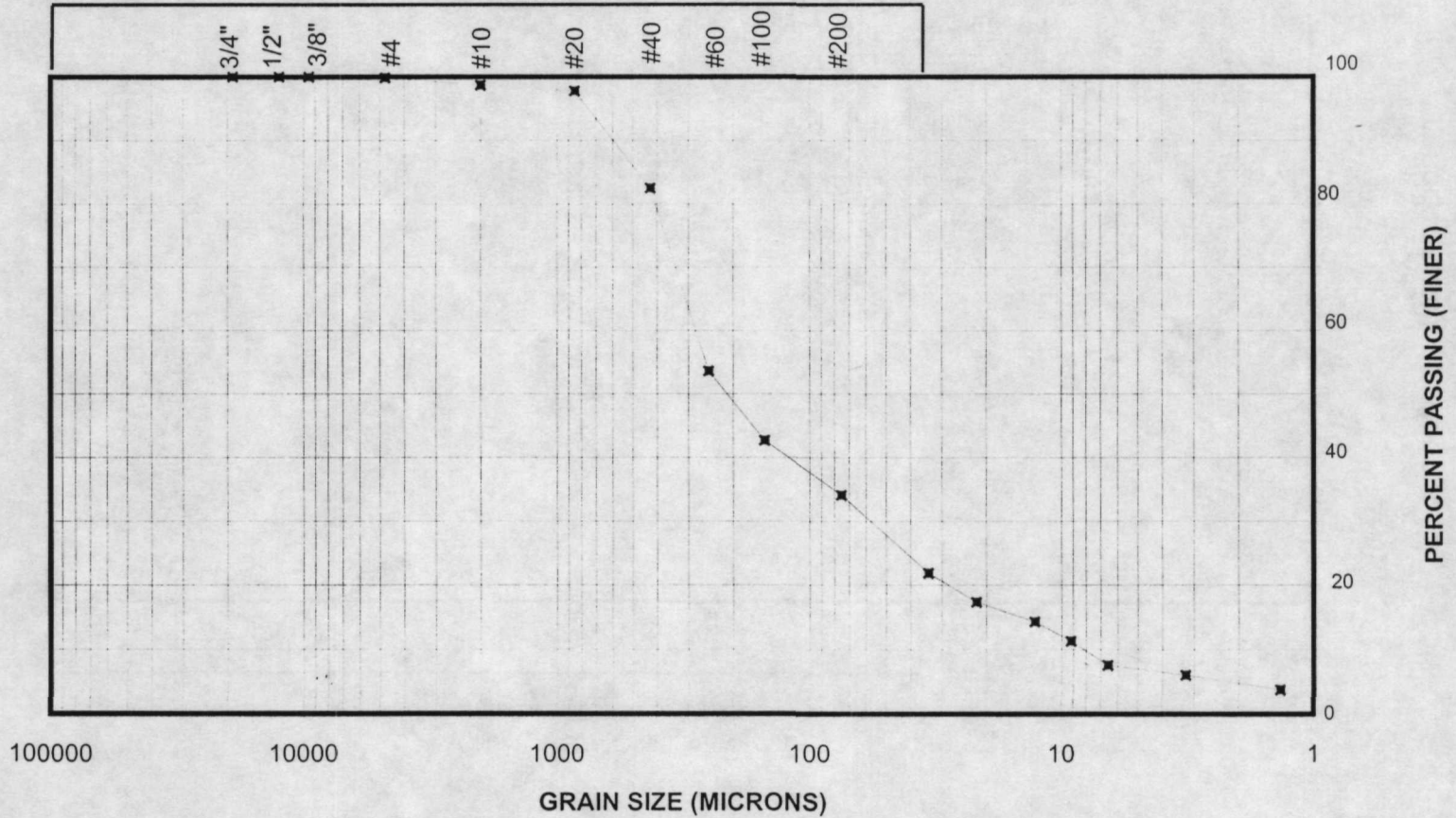
1052-011

6000

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-24



1052-011

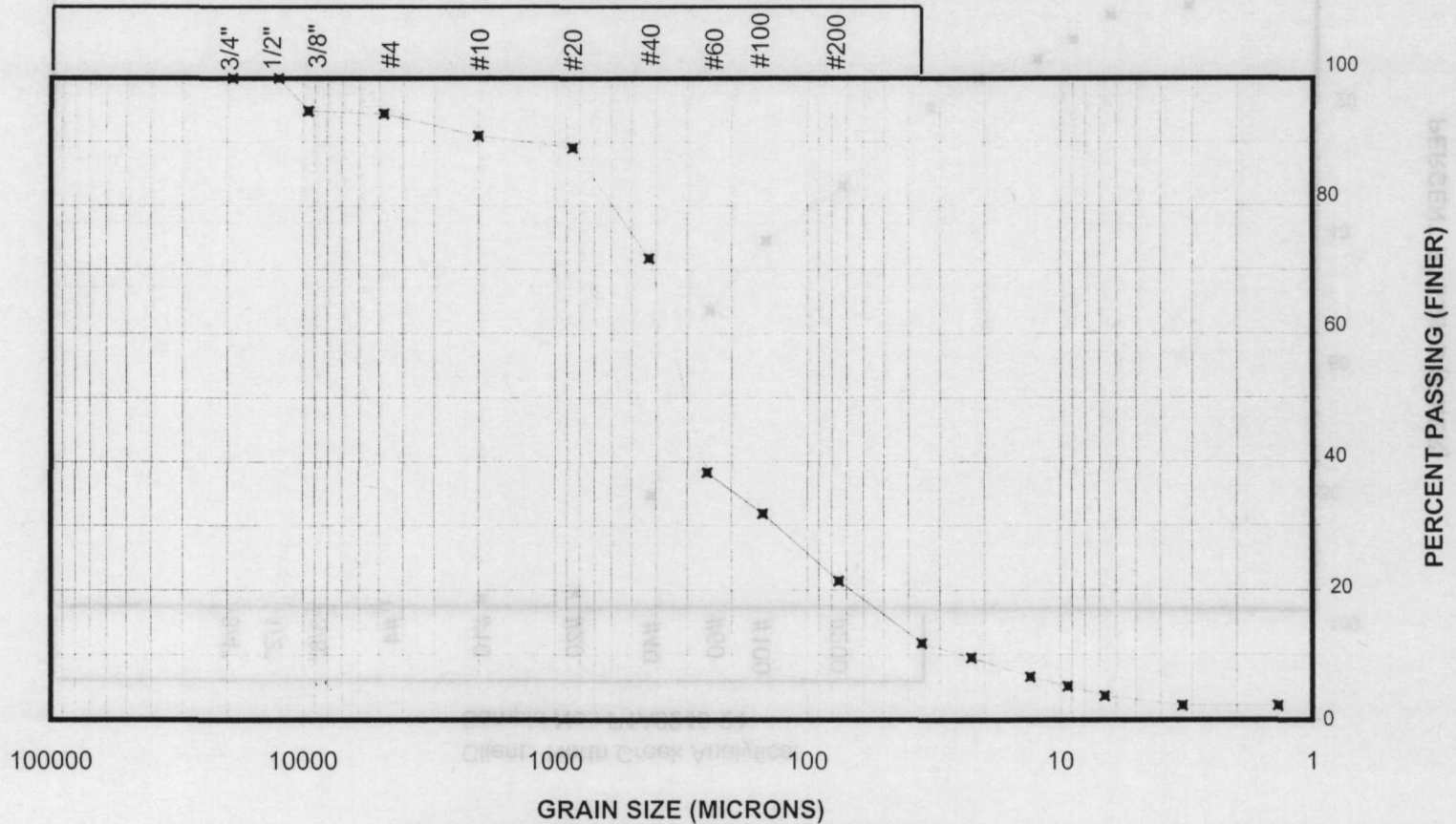
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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-25



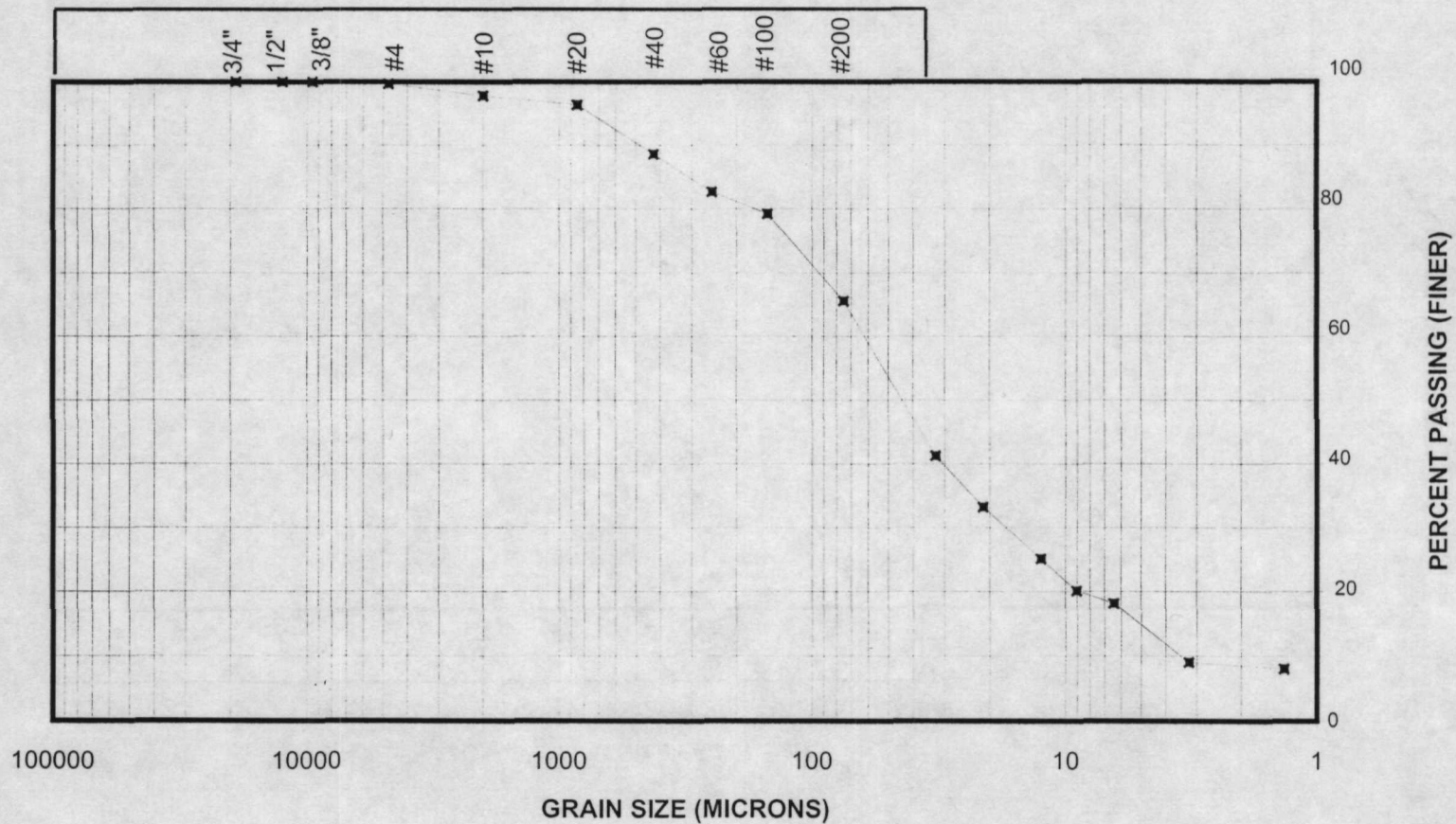
1052-011

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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-26



1052-011

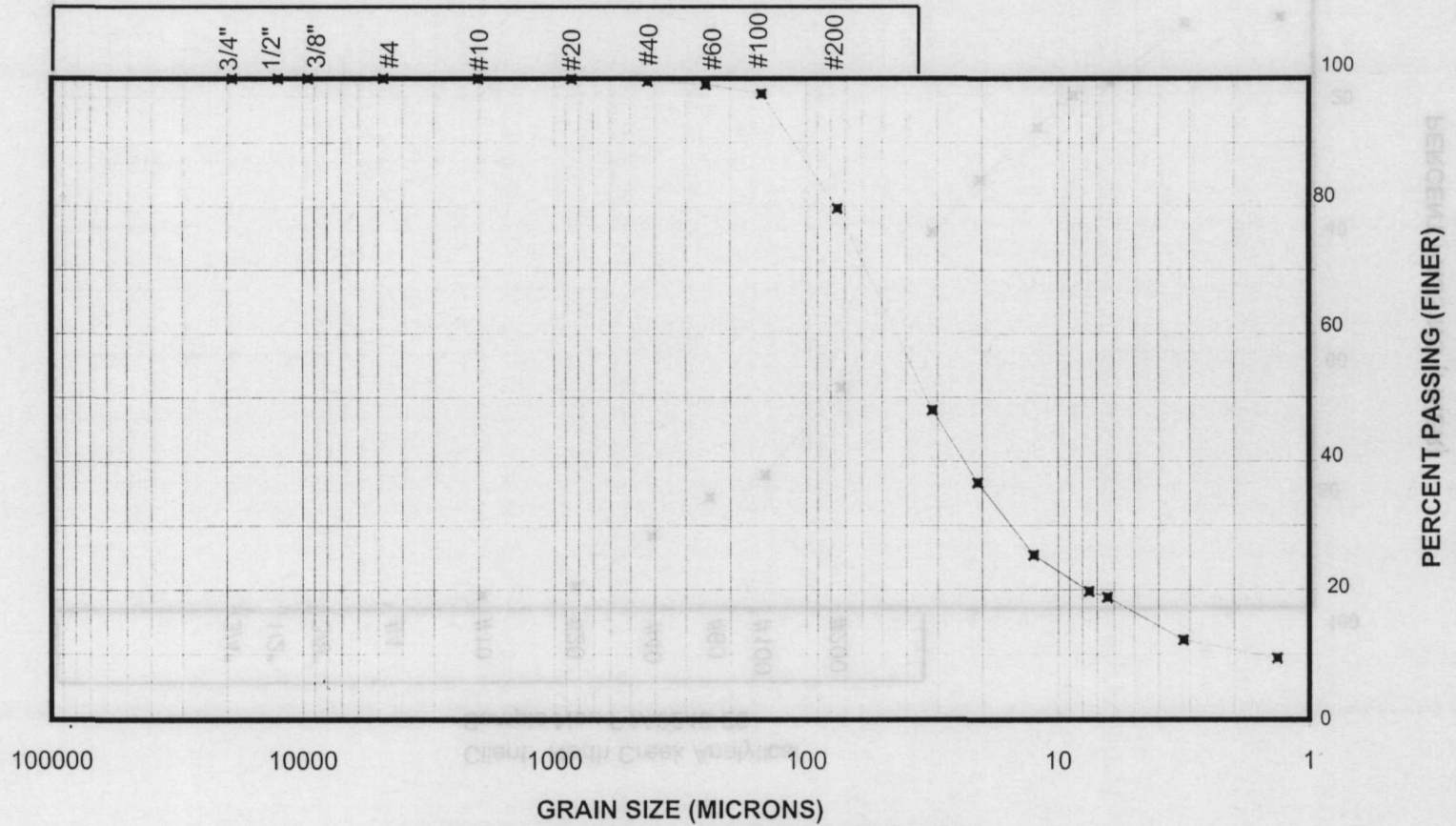
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ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-27



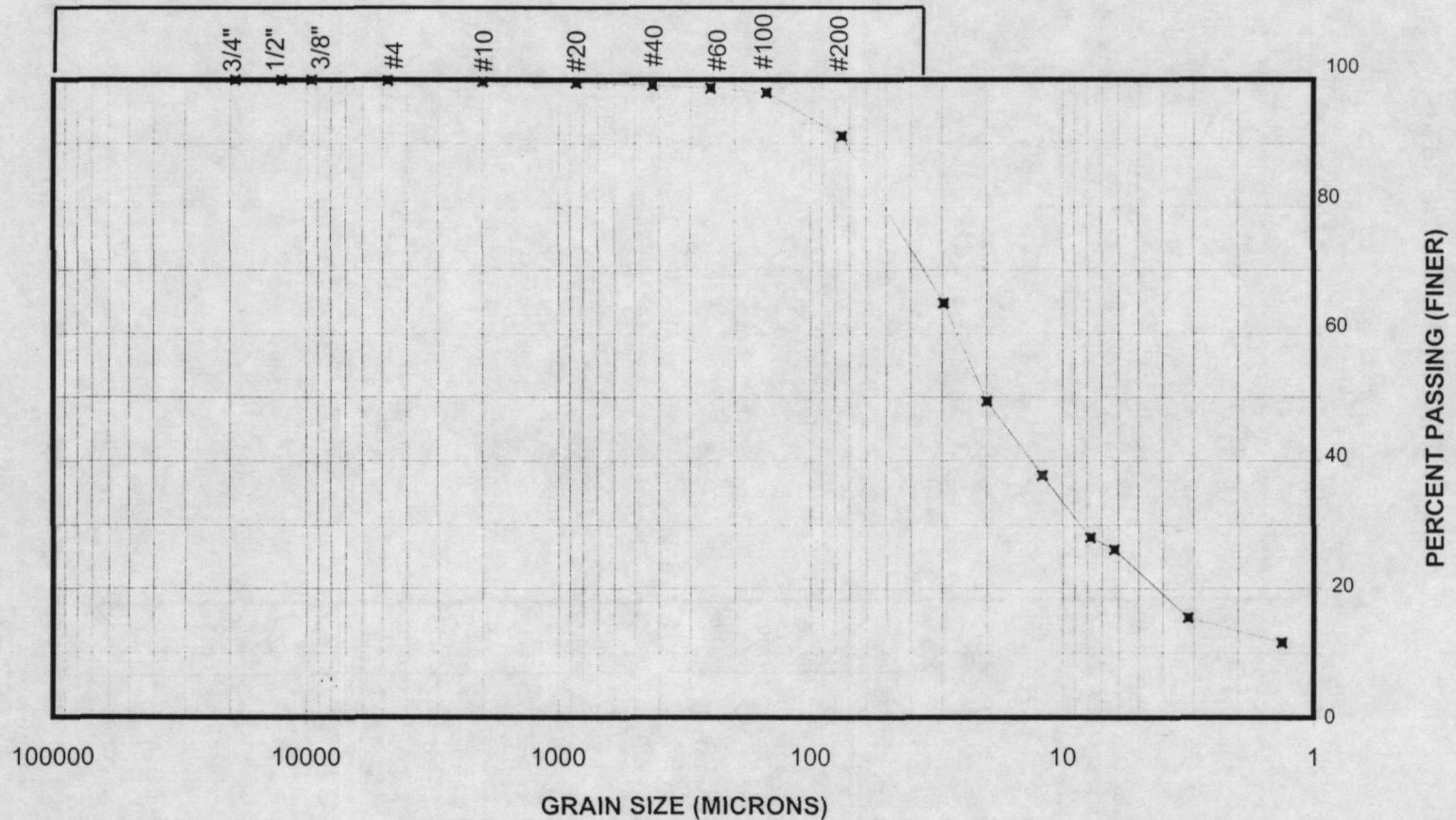
1052-011

60 Gg

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical
Sample No.: P1A0246-28



1052-011

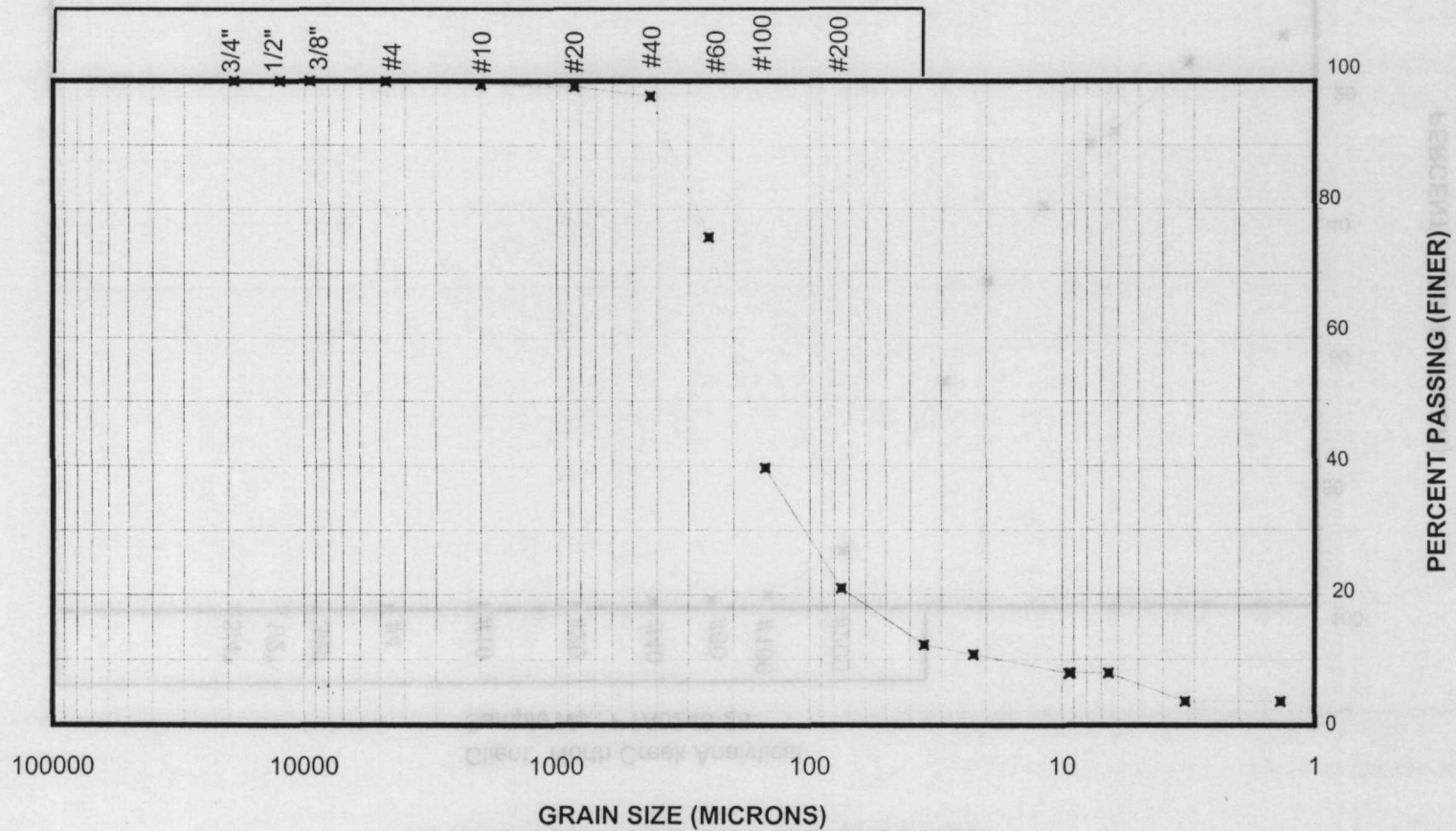
60 HX

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Client: North Creek Analytical

Sample No.: P1A0246-30



1052-011

1109

Case Narrative

CLIENT: Ecology & Environment
PROJECT: McCormick & Baxter
PROJECT #: 000749.OA01.00.07.96.02

January 31, 2001

NCA #: P1A0246

page 1 of 2

1.0 DESCRIPTION OF CASE

North Creek Analytical, Beaverton received thirty-three soil samples on 01/09/01 from Ecology & Environment for analysis by: 8270 SIM PAH and Grain Size. Grain Size analysis was subcontracted to Rosa Environmental and Geotechnical Laboratory.

2.0 SAMPLE LIST

Refer to the *Chain of Custody* documents for a summary of sample information.

Each group of samples received is given an NCA #, preceded by a "P" for Portland. This number consists of a one-digit code for the year, a two-digit code for the month and a sequential number for the group within the month. Each sample within the group is numbered sequentially by placing a dash after the NCA#.

3.0 COMMENTS ON ANALYSIS

3.1 Sample Receipt

The samples were received intact from E & E. Custody seals were not present. The samples were clearly labeled and matched the chain of custody. Sample temperature (3.1 °C) was measured, using a Raytek Thermometer. Sample temperature is recorded with sample log-in information.

3.2 Analysis

The samples were analyzed following the procedures outlined in the applicable methods. The samples were refrigerated at ~4 °C and extracted and analyzed within the EPA recommended holding times without incident, any exceptions are footnoted and described in the *Notes and Definitions* section of the *Analytical Report*. There were no exceptions requiring more detailed explanation.

4.0 QC RESULTS

Surrogate and quality control parameters that were outside control limits are noted on the appropriate pages of the *Analytical Report*. All quality control parameters other than those noted on the *Analytical Report* were within established control limits. Additional Quality Control issues requiring a more detailed explanation are as follows:



Seattle: 206.447.7777
Portland: 503.447.7777
San Francisco: 415.447.7777
Beaverton: 503.447.7777
www.ncalabs.com

Case Narrative

CLIENT: Ecology & Environment
PROJECT: McCormick & Baxter
PROJECT #: OA01.00.27.96.02

June 13, 2000
NCA #: P005537
page 2 of 2

8270 SIM- PAH, PCP

None needed

5.0 SAMPLE RESULTS


Where applicable, qualifiers have been added to sample results as footnotes and are detailed in the *Notes and Definitions* section of the *Analytical Report*. Factors impacting reported sample results and requiring a more detailed explanation than available in the *Notes and Definitions* section of the *Analytical Report* are as follows:

8270 SIM- PAH, PCP

None needed

The dilution factor for a sample, if applicable, is depicted on the *Analytical Report*. MRL(s) for analytes quantitated from the dilution are raised by the dilution factor. The method blank sample may be referenced for the initial MRL.

"I certify that this data package is in compliance with the method, both technically and for completeness, for all conditions other than those listed above. Release of the data in this hard copy data package has been authorized by the Laboratory Director or his designee, as verified by the following signature."


Rochelle Carpenter for
Susan Schimelfining, Technical Administrator
North Creek Analytical, Beaverton

CHAIN OF CUSTODY REPORT

Work Order #: **P190 246**

CLIENT: Ecology & Environment, Inc.			INVOICE TO: Same			TURNAROUND REQUEST in Business Days* Organic & Inorganic Analyses <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> 10</div> <div><input type="checkbox"/> 7</div> <div><input type="checkbox"/> 5</div> <div><input type="checkbox"/> 4</div> <div><input type="checkbox"/> 3</div> <div><input type="checkbox"/> 2</div> <div><input type="checkbox"/> 1</div> <div><input type="checkbox"/> <1</div> </div> STD. <input type="checkbox"/> Petroleum Hydrocarbon Analyses <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> 5</div> <div><input type="checkbox"/> 4</div> <div><input type="checkbox"/> 3</div> <div><input type="checkbox"/> 2</div> <div><input type="checkbox"/> 1</div> <div><input type="checkbox"/> <1</div> </div> STD. <input type="checkbox"/> OTHER Please Specify <small>*Turnaround Requests less than standard may incur Rush Charges.</small>																			
REPORT TO: Peter Bergen																									
ADDRESS: 333 SW 4th Ave, Ste 608 Portland, OR 97204																									
PHONE: 503/248-5400 FAX: 503/248-5577			P.O. NUMBER: 1336669-C-10																						
PROJECT NAME: McLennan & Baxter			REQUESTED ANALYSES																						
PROJECT NUMBER: 000747.000.00.07.96.02																									
SAMPLED BY: H. Brunelle (HB)																									
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME	PALS	GC/MS	GC/MS Size																MATRIX (W, S, O)	# OF CONT.	COMMENTS	N	TO ID
1 SED01-01		11/5/01 1215	X	X																	S	2	✓✓		
2 SED01-02		11/5/01 1200	X	X																	S	2	✓✓		
3 SED01-03		11/5/01 1150	X	X																	S	2	✓✓		
4 SED01-04		11/5/01 0957	X	X																	S	2	✓✓		
5 SED01-05		11/5/01 1440	X	X																	S	2	✓✓/MS/MSD 8260		
6 SED01-06		11/5/01 0925	X	X																	S	2	✓✓		
7 SED01-07		11/5/01 1010	X	X																	S	2	✓✓		
8 SED01-08		11/5/01 1100	X	X																	S	2	✓✓		
9 SED01-09		11/5/01 1035	X	X																	S	2	✓✓		
10 SED01-10		11/5/01 1117	X	X																	S	2	✓✓		
11 SED01-11		11/5/01 1130	X	X																	S	2	✓✓		
12 SED01-12		11/5/01 1340	X	X																	S	2	✓✓		
13 SED01-13		11/5/01 1410	X	X																	S	2	✓✓		
14 SED01-14		11/5/01 1420	X	X																	S	2	✓✓		
15 SED01-15		11/5/01 1453	X	X																	S	2	✓✓		
INQUIRED BY: Heather Brunelle FIRM: EEB			DATE: 11/09/01 TIME: 10:35			RECEIVED BY: Bob F... PRINT NAME: Bob F... FIRM: NCA			DATE: 11/9/01 TIME: 10:35																
INQUIRED BY:			DATE:			RECEIVED BY:			DATE:																
FIRM:			TIME:			FIRM:			TIME:																
ADDITIONAL REMARKS:												TEMP: 3.1°C		PAGE OF											
REV 3/99																									

CHAIN OF CUSTODY REPORT

Work Order #: **PIA0246**

CLIENT: Ecology & Environment, Inc.				INVOICE TO: Same				TURNAROUND REQUEST in Business Days* Organic & Inorganic Analyses <div style="display: flex; justify-content: space-around;"> <div>10</div><div>7</div><div>5</div><div>4</div><div>3</div><div>2</div><div>1</div><div><1</div> </div> STD. Petroleum Hydrocarbon Analyses <div style="display: flex; justify-content: space-around;"> <div>5</div><div>4</div><div>3</div><div>2</div><div>1</div><div><1</div> </div> STD. OTHER Please Specify _____ <small>*Turnaround Requests less than standard may incur Rush Charges.</small>							
REPORT TO: Peter Geigh				ADDRESS: 333 SW Fifth Ave, Ste 608								P.O. NUMBER: 133669-C-10			
PHONE: 503/248-5600				FAX: 503/248-5577											
PROJECT NAME: McClure & Baxter				PROJECT NUMBER: 0419.0001.00.07.96.02				REQUESTED ANALYSES							
SAMPLED BY: H. Brunelle (H)															
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME		PATHS		Grain Size									
1 SED01-16		11/5/01 1508		X X											
2 SED01-17		11/8/01 1115		X X											
3 SED01-18		11/8/01 1015		X X											
4 SED01-19		11/8/01 0940		X X											
5 SED01-20		11/8/01 1125		X X											
6 SED01-21		11/8/01 1030		X X											
7 SED01-22		11/8/01 1000		X X											
8 SED01-23		11/8/01 1138		X X											
9 SED01-24		11/8/01 1055		X X											
10 SED01-25		11/8/01 1155		X X											
11 SED01-26		11/8/01 1500		X X											
12 SED01-27		11/5/01 1530		X X											
13 SED01-28		11/5/01 1540		X X											
14 SED01-29		11/5/01 1550		X X											
15 SED01-30		11/8/01 1355		X X											
INQUIRED BY: Heather Brunelle				DATE: 11/09/01				RECEIVED BY: Bob F...							
FIRM: EEE				TIME: 10:35				FIRM: NCA							
INQUIRED BY:				DATE:				RECEIVED BY:							
FIRM:				TIME:				FIRM:							
ADDITIONAL REMARKS:															
										TEMP: 0					

CHAIN OF CUSTODY REPORT

Work Order #: **PIA0246**

CLIENT: Ecology & Environment, Inc. REPORT TO: Peter Berger ADDRESS: 333 S.W. Fifth Ave, Ste 608 PHONE: 503/248-5600 FAX: 503/248-5577		INVOICE TO: Same P.O. NUMBER: 133669-C-10		TURNAROUND REQUEST in Business Days* <div style="display: flex; justify-content: space-around; font-size: small;"> Organic & Inorganic Analyses Petroleum Hydrocarbon Analyses </div> <div style="display: flex; justify-content: space-around;"> <div> <input type="checkbox"/> 10 <input type="checkbox"/> 7 <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> <1 </div> <div> <input type="checkbox"/> 5 <input type="checkbox"/> 4 <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1 <input type="checkbox"/> <1 </div> </div> <div style="display: flex; justify-content: space-between; font-size: x-small;"> STD. STD. </div> <div style="text-align: center; border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> OTHER </div> <div style="text-align: right; font-size: x-small;"> Please Specify _____ </div> <p style="font-size: x-small; margin-top: 5px;">*Turnaround Requests less than standard may incur Rush Charges.</p>															
PROJECT NAME: McCormick & Baxter PROJECT NUMBER: 44749.0101.00.07.96.03 SAMPLED BY: H. Brunelle		REQUESTED ANALYSES																	
CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PAMS 8240 GC/MS SIM											MATRIX (W. S. O)	# OF CONT.	COMMENTS	N ID	O		
1. SED01-40	11/5/01 0830	X													S	1	✓		
2. SED01-41	11/5/01 1300	X													S	1	✓		
3. SED01-45	11/8/01 1415	X													S	1	✓		
4.																			
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15.																			

REQUESTED BY: Heather Brunelle PRINT NAME: Heather Brunelle FIRM: ECE	DATE: 01/09/04 TIME: 10:35	RECEIVED BY: Bob F... PRINT NAME: Bob F... FIRM: NCA	DATE: 1/9/04 TIME: 10:35
REQUESTED BY: _____ PRINT NAME: _____ FIRM: _____	DATE: _____ TIME: _____	RECEIVED BY: _____ PRINT NAME: _____ FIRM: _____	DATE: _____ TIME: _____

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PAGE **1** OF **1**



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Ecology & Environment
333 SW Fifth Avenue, Suite 608
Portland, OR 97204

Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
01/25/01 15:31

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SED01-01	P1A0246-01	Soil	01/05/01 12:15	01/09/01 10:35
SED01-02	P1A0246-02	Soil	01/05/01 12:00	01/09/01 10:35
SED01-03	P1A0246-03	Soil	01/05/01 11:50	01/09/01 10:35
SED01-04	P1A0246-04	Soil	01/05/01 09:57	01/09/01 10:35
SED01-05	P1A0246-05	Soil	01/05/01 14:40	01/09/01 10:35
SED01-06	P1A0246-06	Soil	01/05/01 09:45	01/09/01 10:35
SED01-07	P1A0246-07	Soil	01/05/01 10:10	01/09/01 10:35
SED01-08	P1A0246-08	Soil	01/05/01 11:00	01/09/01 10:35
SED01-09	P1A0246-09	Soil	01/05/01 10:35	01/09/01 10:35
SED01-10	P1A0246-10	Soil	01/05/01 11:17	01/09/01 10:35
SED01-11	P1A0246-11	Soil	01/05/01 11:30	01/09/01 10:35
SED01-12	P1A0246-12	Soil	01/05/01 13:40	01/09/01 10:35
SED01-13	P1A0246-13	Soil	01/05/01 14:10	01/09/01 10:35
SED01-14	P1A0246-14	Soil	01/05/01 14:20	01/09/01 10:35
SED01-15	P1A0246-15	Soil	01/05/01 14:53	01/09/01 10:35
SED01-16	P1A0246-16	Soil	01/05/01 15:08	01/09/01 10:35
SED01-17	P1A0246-17	Soil	01/08/01 11:15	01/09/01 10:35
SED01-18	P1A0246-18	Soil	01/08/01 10:15	01/09/01 10:35
SED01-19	P1A0246-19	Soil	01/08/01 09:40	01/09/01 10:35
SED01-20	P1A0246-20	Soil	01/08/01 11:25	01/09/01 10:35
SED01-21	P1A0246-21	Soil	01/08/01 10:30	01/09/01 10:35
SED01-22	P1A0246-22	Soil	01/08/01 10:00	01/09/01 10:35
SED01-23	P1A0246-23	Soil	01/08/01 11:38	01/09/01 10:35
SED01-24	P1A0246-24	Soil	01/08/01 10:55	01/09/01 10:35
SED01-25	P1A0246-25	Soil	01/08/01 11:55	01/09/01 10:35
SED01-26	P1A0246-26	Soil	01/08/01 15:00	01/09/01 10:35
SED01-27	P1A0246-27	Soil	01/05/01 15:30	01/09/01 10:35
SED01-28	P1A0246-28	Soil	01/05/01 15:40	01/09/01 10:35
SED01-29	P1A0246-29	Soil	01/05/01 15:50	01/09/01 10:35

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Project: McCormick and Baxter
Project Number: 000749.QA01.00.07.96.02
Project Manager: Pete Geiger


Reported:
01/25/01 15:31

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SED01-30	P1A0246-30	Soil	01/08/01 13:55	01/09/01 10:35
SED01-40	P1A0246-31	Soil	01/05/01 08:30	01/09/01 10:35
SED01-41	P1A0246-32	Soil	01/05/01 13:00	01/09/01 10:35
SED01-45	P1A0246-33	Soil	01/08/01 14:15	01/09/01 10:35

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-01 (P1A0246-01) Soil					Sampled: 01/05/01 Received: 01/09/01				R-05
Acenaphthene	ND	64.1	ug/kg dry	2	EPA 8270 mod.	01/17/01	01/22/01	1010483	
Acenaphthylene	ND	64.1	"	"	"	"	"	"	
Anthracene	ND	64.1	"	"	"	"	"	"	
Benzo (a) anthracene	77.8	64.1	"	"	"	"	"	"	
Benzo (a) pyrene	ND	160	"	5	"	"	01/23/01	"	
Benzo (b) fluoranthene	ND	160	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	160	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	160	"	"	"	"	"	"	
Chrysene	126	64.1	"	2	"	"	01/22/01	"	
Dibenzo (a,h) anthracene	ND	160	"	5	"	"	01/23/01	"	
Fluoranthene	138	64.1	"	2	"	"	01/22/01	"	
Fluorene	ND	64.1	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	160	"	5	"	"	01/23/01	"	
Naphthalene	ND	64.1	"	2	"	"	01/22/01	"	
Pentachlorophenol	ND	320	"	"	"	"	"	"	
Phenanthrene	93.1	64.1	"	"	"	"	"	"	
Pyrene	158	64.1	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	86.9 %	48-138							
Surr: Nitrobenzene-d5	90.5 %	50-132							
Surr: p-Terphenyl-d14	93.0 %	58-143							
Surr: 2,4,6-Tribromophenol	116 %	19-122							

SED01-02 (P1A0246-02) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	79.4	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	25.6	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	31.1	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	21.4	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	34.0	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	17.9	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	33.0	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	92.5	13.4	"	"	"	"	"	"	
Fluorene	58.7	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	386	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-02 (P1A0246-02) Soil						Sampled: 01/05/01 Received: 01/09/01			
Phenanthrene	116	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Pyrene	77.3	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	67.4 %	48-138							
Surr: Nitrobenzene-d5	72.3 %	50-132							
Surr: p-Terphenyl-d14	73.7 %	58-143							
Surr: 2,4,6-Tribromophenol	92.5 %	19-122							
SED01-03 (P1A0246-03) Soil						Sampled: 01/05/01 Received: 01/09/01			
Acenaphthene	ND	28.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	28.4	"	"	"	"	"	"	
Anthracene	ND	28.4	"	"	"	"	"	"	
Benzo (a) anthracene	41.0	28.4	"	"	"	"	"	"	
Benzo (a) pyrene	40.6	28.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	56.4	28.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	39.7	28.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	28.4	"	"	"	"	"	"	
Chrysene	58.5	28.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	28.4	"	"	"	"	"	"	
Fluoranthene	95.4	28.4	"	"	"	"	"	"	
Fluorene	ND	28.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	28.4	"	"	"	"	"	"	
Naphthalene	ND	28.4	"	"	"	"	"	"	
Pentachlorophenol	ND	142	"	"	"	"	"	"	
Phenanthrene	43.5	28.4	"	"	"	"	"	"	
Pyrene	89.3	28.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	67.8 %	48-138							
Surr: Nitrobenzene-d5	71.8 %	50-132							
Surr: p-Terphenyl-d14	81.9 %	58-143							
Surr: 2,4,6-Tribromophenol	92.1 %	19-122							

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-04 (P1A0246-04) Soil

Sampled: 01/05/01 Received: 01/09/01

Acenaphthene	ND	27.1	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	27.1	"	"	"	"	"	"	
Anthracene	ND	27.1	"	"	"	"	"	"	
Benzo (a) anthracene	40.6	27.1	"	"	"	"	"	"	
Benzo (a) pyrene	35.8	27.1	"	"	"	"	"	"	
Benzo (b) fluoranthene	65.6	27.1	"	"	"	"	"	"	
Benzo (k) fluoranthene	41.0	27.1	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	27.1	"	"	"	"	"	"	
Chrysene	70.3	27.1	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	27.1	"	"	"	"	"	"	
Fluoranthene	109	27.1	"	"	"	"	"	"	
Fluorene	ND	27.1	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	27.1	"	"	"	"	"	"	
Naphthalene	ND	27.1	"	"	"	"	"	"	
Pentachlorophenol	ND	136	"	"	"	"	"	"	
Phenanthrene	51.6	27.1	"	"	"	"	"	"	
Pyrene	89.4	27.1	"	"	"	"	"	"	

Surr: 2-Fluorobiphenyl	69.2 %	48-138
Surr: Nitrobenzene-d5	74.6 %	50-132
Surr: p-Terphenyl-d14	80.5 %	58-143
Surr: 2,4,6-Tribromophenol	90.5 %	19-122

SED01-05 (P1A0246-05) Soil


Sampled: 01/05/01 Received: 01/09/01

R-05

Acenaphthene	ND	57.2	ug/kg dry	2	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	57.2	"	"	"	"	"	"	
Anthracene	ND	57.2	"	"	"	"	"	"	
Benzo (a) anthracene	ND	57.2	"	"	"	"	"	"	
Benzo (a) pyrene	ND	57.2	"	"	"	"	"	"	
Benzo (b) fluoranthene	66.9	57.2	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	57.2	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	57.2	"	"	"	"	"	"	
Chrysene	70.4	57.2	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	57.2	"	"	"	"	"	"	
Fluoranthene	116	57.2	"	"	"	"	"	"	
Fluorene	ND	57.2	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	57.2	"	"	"	"	"	"	
Naphthalene	ND	57.2	"	"	"	"	"	"	
Pentachlorophenol	ND	286	"	"	"	"	"	"	

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Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-05 (P1A0246-05) Soil					Sampled: 01/05/01 Received: 01/09/01		R-05		
Phenanthrene	ND	57.2	ug/kg dry	2	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Pyrene	117	57.2	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	77.5 %	48-138							
Surr: Nitrobenzene-d5	72.5 %	50-132							
Surr: p-Terphenyl-d14	91.0 %	58-143							
Surr: 2,4,6-Tribromophenol	108 %	19-122							
SED01-06 (P1A0246-06) Soil					Sampled: 01/05/01 Received: 01/09/01		R-05		
Acenaphthene	72.1	57.9	ug/kg dry	2	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	57.9	"	"	"	"	"	"	
Anthracene	60.5	57.9	"	"	"	"	"	"	
Benzo (a) anthracene	168	57.9	"	"	"	"	"	"	
Benzo (a) pyrene	146	57.9	"	"	"	"	"	"	
Benzo (b) fluoranthene	214	57.9	"	"	"	"	"	"	
Benzo (k) fluoranthene	126	57.9	"	"	"	"	"	"	
Benzo (ghi) perylene	67.7	57.9	"	"	"	"	"	"	
Chrysene	239	57.9	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	57.9	"	"	"	"	"	"	
Fluoranthene	291	57.9	"	"	"	"	"	"	
Fluorene	74.4	57.9	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	68.3	57.9	"	"	"	"	"	"	
Naphthalene	ND	57.9	"	"	"	"	"	"	
Pentachlorophenol	ND	290	"	"	"	"	"	"	
Phenanthrene	197	57.9	"	"	"	"	"	"	
Pyrene	280	57.9	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	73.9 %	48-138							
Surr: Nitrobenzene-d5	70.6 %	50-132							
Surr: p-Terphenyl-d14	87.2 %	58-143							
Surr: 2,4,6-Tribromophenol	109 %	19-122							

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Reported:
01/25/01 15:31


Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-07 (P1A0246-07) Soil						Sampled: 01/05/01 Received: 01/09/01		R-05	
Acenaphthene	20800	3010	ug/kg dry	100	EPA 8270 mod.	01/17/01	01/22/01	1010483	
Acenaphthylene	ND	3010	"	"	"	"	"	"	
Anthracene	6140	3010	"	"	"	"	"	"	
Benzo (a) anthracene	3340	150	"	5	"	"	01/19/01	"	
Benzo (a) pyrene	1110	150	"	"	"	"	"	"	
Benzo (b) fluoranthene	1530	150	"	"	"	"	"	"	
Benzo (k) fluoranthene	1090	150	"	"	"	"	"	"	
Benzo (ghi) perylene	308	150	"	"	"	"	"	"	
Chrysene	3370	150	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	150	"	"	"	"	"	"	
Fluoranthene	20100	3010	"	100	"	"	01/22/01	"	
Fluorene	15800	3010	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	342	150	"	5	"	"	01/19/01	"	
Naphthalene	161	150	"	"	"	"	"	"	
Pentachlorophenol	ND	15000	"	100	"	"	01/22/01	"	
Phenanthrene	39200	3010	"	"	"	"	"	"	
Pyrene	13600	3010	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	NR	48-138							S-01
Surr: Nitrobenzene-d5	83.4 %	50-132							
Surr: p-Terphenyl-d14	93.0 %	58-143							
Surr: 2,4,6-Tribromophenol	NR	19-122							S-01

SED01-08 (P1A0246-08) Soil						Sampled: 01/05/01 Received: 01/09/01			
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	19.3	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	17.1	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	14.3	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	14.8	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	19.2	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	25.5	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	

North Creek Analytical - Portland

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333 SW Fifth Avenue, Suite 608
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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-08 (P1A0246-08) Soil						Sampled: 01/05/01 Received: 01/09/01			
Phenanthrene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Pyrene	28.3	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	71.5 %	48-138							
Surr: Nitrobenzene-d5	80.0 %	50-132							
Surr: p-Terphenyl-d14	81.0 %	58-143							
Surr: 2,4,6-Tribromophenol	81.4 %	19-122							
SED01-09 (P1A0246-09) Soil						Sampled: 01/05/01 Received: 01/09/01			
Acenaphthene	148	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	20.8	13.4	"	"	"	"	"	"	
Anthracene	38.6	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	140	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	128	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	151	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	96.5	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	73.3	13.4	"	"	"	"	"	"	
Chrysene	179	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	19.3	13.4	"	"	"	"	"	"	
Fluoranthene	363	13.4	"	"	"	"	"	"	
Fluorene	38.1	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	65.6	13.4	"	"	"	"	"	"	
Naphthalene	22.2	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	278	13.4	"	"	"	"	"	"	
Pyrene	379	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	69.6 %	48-138							
Surr: Nitrobenzene-d5	81.2 %	50-132							
Surr: p-Terphenyl-d14	81.2 %	58-143							
Surr: 2,4,6-Tribromophenol	92.5 %	19-122							

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-10 (P1A0246-10) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	15.3	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	17.0	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	22.1	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	26.5	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	72.9 %	48-138							
Surr: Nitrobenzene-d5	79.7 %	50-132							
Surr: p-Terphenyl-d14	76.9 %	58-143							
Surr: 2,4,6-Tribromophenol	89.0 %	19-122							

SED01-11 (P1A0246-11) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	26.9	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	

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Project: McCormick and Baxter
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Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-11 (PIA0246-11) Soil

Sampled: 01/05/01 Received: 01/09/01

Phenanthrene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/19/01	1010483	
Pyrene	24.0	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	73.0 %	48-138							
Surr: Nitrobenzene-d5	81.7 %	50-132							
Surr: p-Terphenyl-d14	79.8 %	58-143							
Surr: 2,4,6-Tribromophenol	90.3 %	19-122							


SED01-12 (PIA0246-12) Soil

Sampled: 01/05/01 Received: 01/09/01

Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/17/01	01/22/01	1010483	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	ND	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	ND	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	88.4 %	48-138							
Surr: Nitrobenzene-d5	98.1 %	50-132							
Surr: p-Terphenyl-d14	95.3 %	58-143							
Surr: 2,4,6-Tribromophenol	87.5 %	19-122							

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-13 (P1A0246-13) Soil					Sampled: 01/05/01 Received: 01/09/01			R-05	
Acenaphthene	43900	3800	ug/kg dry	125	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	3800	"	"	"	"	"	"	
Anthracene	11800	3800	"	"	"	"	"	"	
Benzo (a) anthracene	6080	152	"	5	"	"	01/22/01	"	
Benzo (a) pyrene	1850	152	"	"	"	"	"	"	
Benzo (b) fluoranthene	2490	152	"	"	"	"	"	"	
Benzo (k) fluoranthene	1770	152	"	"	"	"	"	"	
Benzo (ghi) perylene	474	152	"	"	"	"	"	"	
Chrysene	5650	152	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	185	152	"	"	"	"	"	"	
Fluoranthene	40400	3800	"	125	"	"	01/23/01	"	
Fluorene	34500	3800	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	498	152	"	5	"	"	01/22/01	"	
Naphthalene	369	152	"	"	"	"	"	"	
Pentachlorophenol	ND	19000	"	125	"	"	01/23/01	"	
Phenanthrene	83000	3800	"	"	"	"	"	"	
Pyrene	22700	3800	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	NR	48-138							S-01
Surr: Nitrobenzene-d5	NR	50-132							S-02
Surr: p-Terphenyl-d14	111 %	58-143							
Surr: 2,4,6-Tribromophenol	NR	19-122							S-01
SED01-14 (P1A0246-14) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	ND	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-14 (P1A0246-14) Soil					Sampled: 01/05/01 Received: 01/09/01				
Phenanthrene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Pyrene	ND	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	88.9 %	48-138							
Surr: Nitrobenzene-d5	100 %	50-132							
Surr: p-Terphenyl-d14	88.0 %	58-143							
Surr: 2,4,6-Tribromophenol	104 %	19-122							
SED01-15 (P1A0246-15) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	ND	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	ND	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	86.3 %	48-138							
Surr: Nitrobenzene-d5	102 %	50-132							
Surr: p-Terphenyl-d14	84.7 %	58-143							
Surr: 2,4,6-Tribromophenol	101 %	19-122							

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Project: McCormick and Baxter
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Project Manager: Pete Geiger

Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-16 (PIA0246-16) Soil

Sampled: 01/05/01 Received: 01/09/01

Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	ND	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	ND	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	80.0 %	48-138							
Surr: Nitrobenzene-d5	94.6 %	50-132							
Surr: p-Terphenyl-d14	71.0 %	58-143							
Surr: 2,4,6-Tribromophenol	93.7 %	19-122							

SED01-17 (PIA0246-17) Soil

Sampled: 01/08/01 Received: 01/09/01

Acenaphthene	384	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	30.9	13.4	"	"	"	"	"	"	
Anthracene	90.7	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	541	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	412	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	319	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	299	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	169	13.4	"	"	"	"	"	"	
Chrysene	455	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	61.0	13.4	"	"	"	"	"	"	
Fluoranthene	712	13.4	"	"	"	"	"	"	
Fluorene	211	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	184	13.4	"	"	"	"	"	"	
Naphthalene	22.4	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	

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Ecology & Environment
333 SW Fifth Avenue, Suite 608
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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
01/25/01 15:31

Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-17 (P1A0246-17) Soil

Sampled: 01/08/01 Received: 01/09/01

Phenanthrene	242	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Pyrene	555	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	86.2 %	48-138							
Surr: Nitrobenzene-d5	103 %	50-132							
Surr: p-Terphenyl-d14	80.4 %	58-143							
Surr: 2,4,6-Tribromophenol	110 %	19-122							

SED01-18 (P1A0246-18) Soil


Sampled: 01/08/01 Received: 01/09/01

R-05

Acenaphthene	209	57.9	ug/kg dry	2	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Acenaphthylene	ND	57.9	"	"	"	"	"	"	
Anthracene	72.5	57.9	"	"	"	"	"	"	
Benzo (a) anthracene	259	57.9	"	"	"	"	"	"	
Benzo (a) pyrene	171	57.9	"	"	"	"	"	"	
Benzo (b) fluoranthene	240	57.9	"	"	"	"	"	"	
Benzo (k) fluoranthene	174	57.9	"	"	"	"	"	"	
Benzo (ghi) perylene	73.4	57.9	"	"	"	"	"	"	
Chrysene	281	57.9	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	57.9	"	"	"	"	"	"	
Fluoranthene	731	57.9	"	"	"	"	"	"	
Fluorene	181	57.9	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	74.0	57.9	"	"	"	"	"	"	
Naphthalene	ND	57.9	"	"	"	"	"	"	
Pentachlorophenol	ND	289	"	"	"	"	"	"	
Phenanthrene	587	57.9	"	"	"	"	"	"	
Pyrene	581	57.9	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	79.4 %	48-138							
Surr: Nitrobenzene-d5	85.0 %	50-132							
Surr: p-Terphenyl-d14	85.0 %	58-143							
Surr: 2,4,6-Tribromophenol	105 %	19-122							

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

Reported:
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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-19 (P1A0246-19) Soil

Sampled: 01/08/01 Received: 01/09/01

Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	15.1	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	13.5	13.4	"	"	"	"	"	"	
Chrysene	17.9	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	23.5	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	21.1	13.4	"	"	"	"	"	"	

Surr: 2-Fluorobiphenyl	78.1 %	48-138
Surr: Nitrobenzene-d5	88.3 %	50-132
Surr: p-Terphenyl-d14	82.0 %	58-143
Surr: 2,4,6-Tribromophenol	110 %	19-122

SED01-20 (P1A0246-20) Soil


Sampled: 01/08/01 Received: 01/09/01

R-05

Acenaphthene	804	26.8	ug/kg dry	2	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Acenaphthylene	ND	26.8	"	"	"	"	"	"	
Anthracene	161	26.8	"	"	"	"	"	"	
Benzo (a) anthracene	271	26.8	"	"	"	"	"	"	
Benzo (a) pyrene	141	26.8	"	"	"	"	"	"	
Benzo (b) fluoranthene	203	26.8	"	"	"	"	"	"	
Benzo (k) fluoranthene	146	26.8	"	"	"	"	"	"	
Benzo (ghi) perylene	50.9	26.8	"	"	"	"	"	"	
Chrysene	280	26.8	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	26.8	"	"	"	"	"	"	
Fluoranthene	967	26.8	"	"	"	"	"	"	
Fluorene	627	26.8	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	52.0	26.8	"	"	"	"	"	"	
Naphthalene	81.8	26.8	"	"	"	"	"	"	
Pentachlorophenol	ND	134	"	"	"	"	"	"	

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-20 (P1A0246-20) Soil					Sampled: 01/08/01 Received: 01/09/01				R-05
Phenanthrene	1540	26.8	ug/kg dry	2	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Pyrene	696	26.8	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	84.8 %	48-138							
Surr: Nitrobenzene-d5	89.7 %	50-132							
Surr: p-Terphenyl-d14	88.5 %	58-143							
Surr: 2,4,6-Tribromophenol	115 %	19-122							
SED01-21 (P1A0246-21) Soil					Sampled: 01/08/01 Received: 01/09/01				
Acenaphthene	18.0	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	24.4	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	27.4	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	27.1	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	19.3	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	20.9	13.4	"	"	"	"	"	"	
Chrysene	28.1	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	44.7	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	17.7	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	31.2	13.4	"	"	"	"	"	"	
Pyrene	48.5	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	90.0 %	48-138							
Surr: Nitrobenzene-d5	111 %	50-132							
Surr: p-Terphenyl-d14	85.0 %	58-143							
Surr: 2,4,6-Tribromophenol	109 %	19-122							

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-22 (P1A0246-22) Soil						Sampled: 01/08/01 Received: 01/09/01			
Acenaphthene	91.9	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	36.8	13.4	"	"	"	"	"	"	
Anthracene	ND	268	"	20	"	"	01/24/01	"	R-03
Benzo (a) anthracene	271	13.4	"	1	"	"	01/23/01	"	
Benzo (a) pyrene	231	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	193	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	146	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	175	13.4	"	"	"	"	"	"	
Chrysene	314	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	34.1	13.4	"	"	"	"	"	"	
Fluoranthene	1400	268	"	20	"	"	01/24/01	"	
Fluorene	36.2	13.4	"	1	"	"	01/23/01	"	
Indeno (1,2,3-cd) pyrene	141	13.4	"	"	"	"	"	"	
Naphthalene	23.4	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	1340	"	20	"	"	01/24/01	"	R-03
Phenanthrene	1730	268	"	"	"	"	"	"	
Pyrene	1250	268	"	"	"	"	"	"	

Surr: 2-Fluorobiphenyl 81.5 % 48-138
Surr: Nitrobenzene-d5 98.4 % 50-132
Surr: p-Terphenyl-d14 83.1 % 58-143
Surr: 2,4,6-Tribromophenol 104 % 19-122

SED01-23 (P1A0246-23) Soil					Sampled: 01/08/01		Received: 01/09/01		R-05
Acenaphthene	ND	53.9	ug/kg dry	2	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Acenaphthylene	ND	53.9	"	"	"	"	"	"	
Anthracene	ND	53.9	"	"	"	"	"	"	
Benzo (a) anthracene	90.6	53.9	"	"	"	"	"	"	
Benzo (a) pyrene	75.4	53.9	"	"	"	"	"	"	
Benzo (b) fluoranthene	113	53.9	"	"	"	"	"	"	
Benzo (k) fluoranthene	78.6	53.9	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	53.9	"	"	"	"	"	"	
Chrysene	118	53.9	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	53.9	"	"	"	"	"	"	
Fluoranthene	240	53.9	"	"	"	"	"	"	
Fluorene	ND	53.9	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	53.9	"	"	"	"	"	"	
Naphthalene	ND	53.9	"	"	"	"	"	"	
Pentachlorophenol	ND	270	"	"	"	"	"	"	

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Project: McCormick and Baxter
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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-23 (P1A0246-23) Soil					Sampled: 01/08/01		Received: 01/09/01		R-05
Phenanthrene	154	53.9	ug/kg dry	2	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Pyrene	206	53.9	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	83.3 %	48-138							
Surr: Nitrobenzene-d5	88.1 %	50-132							
Surr: p-Terphenyl-d14	91.1 %	58-143							
Surr: 2,4,6-Tribromophenol	114 %	19-122							
SED01-24 (P1A0246-24) Soil					Sampled: 01/08/01		Received: 01/09/01		
Acenaphthene	36.0	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	15.7	13.4	"	"	"	"	"	"	
Anthracene	40.1	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	163	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	150	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	157	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	98.2	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	115	13.4	"	"	"	"	"	"	
Chrysene	187	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	26.0	13.4	"	"	"	"	"	"	
Fluoranthene	192	13.4	"	"	"	"	"	"	
Fluorene	22.3	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	97.2	13.4	"	"	"	"	"	"	
Naphthalene	31.5	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	384	13.4	"	"	"	"	"	"	
Pyrene	387	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	87.2 %	48-138							
Surr: Nitrobenzene-d5	108 %	50-132							
Surr: p-Terphenyl-d14	92.5 %	58-143							
Surr: 2,4,6-Tribromophenol	114 %	19-122							

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Project Manager: Pete Geiger

Reported:
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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-25 (P1A0246-25) Soil									
						Sampled: 01/08/01 Received: 01/09/01			
Acenaphthene	73.1	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	22.9	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	90.2	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	86.7	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	72.0	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	60.3	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	60.0	13.4	"	"	"	"	"	"	
Chrysene	107	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	210	13.4	"	"	"	"	"	"	
Fluorene	27.6	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	50.7	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	105	13.4	"	"	"	"	"	"	
Pyrene	179	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	73.1 %	48-138							
Surr: Nitrobenzene-d5	89.3 %	50-132							
Surr: p-Terphenyl-d14	81.6 %	58-143							
Surr: 2,4,6-Tribromophenol	102 %	19-122							

SED01-26 (P1A0246-26) Soil									
						Sampled: 01/08/01 Received: 01/09/01			
Acenaphthene	ND	140	ug/kg dry	5	EPA 8270 mod.	01/18/01	01/22/01	1010524	R-05
Acenaphthylene	ND	140	"	"	"	"	"	"	
Anthracene	155	140	"	"	"	"	"	"	
Benzo (a) anthracene	235	140	"	"	"	"	"	"	
Benzo (a) pyrene	195	140	"	"	"	"	"	"	
Benzo (b) fluoranthene	194	140	"	"	"	"	"	"	
Benzo (k) fluoranthene	145	140	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	140	"	"	"	"	"	"	
Chrysene	393	140	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	140	"	"	"	"	"	"	
Fluoranthene	455	140	"	"	"	"	"	"	
Fluorene	ND	140	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	140	"	"	"	"	"	"	
Naphthalene	ND	140	"	"	"	"	"	"	
Pentachlorophenol	ND	702	"	"	"	"	"	"	

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-26 (P1A0246-26) Soil					Sampled: 01/08/01 Received: 01/09/01		R-05		
Phenanthrene	617	140	ug/kg dry	5	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Pyrene	626	140	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	96.6 %	48-138							
Surr: Nitrobenzene-d5	100 %	50-132							
Surr: p-Terphenyl-d14	88.6 %	58-143							
Surr: 2,4,6-Tribromophenol	139 %	19-122							A-01
SED01-27 (P1A0246-27) Soil					Sampled: 01/05/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	16.9	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	18.6	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	19.8	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	17.1	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	16.8	13.4	"	"	"	"	"	"	
Chrysene	24.6	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	36.0	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	19.3	13.4	"	"	"	"	"	"	
Pyrene	32.2	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	81.3 %	48-138							
Surr: Nitrobenzene-d5	91.0 %	50-132							
Surr: p-Terphenyl-d14	89.0 %	58-143							
Surr: 2,4,6-Tribromophenol	108 %	19-122							

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Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-28 (P1A0246-28) Soil						Sampled: 01/05/01 Received: 01/09/01			
Acenaphthene	2790	1420	ug/kg dry	50	EPA 8270 mod.	01/18/01	01/24/01	1010524	
Acenaphthylene	35.8	28.3	"	1	"	"	01/23/01	"	
Anthracene	ND	1420	"	50	"	"	01/24/01	"	R-03
Benzo (a) anthracene	724	28.3	"	1	"	"	01/23/01	"	
Benzo (a) pyrene	298	28.3	"	"	"	"	"	"	
Benzo (b) fluoranthene	644	28.3	"	"	"	"	"	"	
Benzo (k) fluoranthene	262	28.3	"	"	"	"	"	"	
Benzo (ghi) perylene	102	28.3	"	"	"	"	"	"	
Chrysene	819	28.3	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	55.9	28.3	"	"	"	"	"	"	
Fluoranthene	2660	1420	"	50	"	"	01/24/01	"	
Fluorene	2350	1420	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	116	28.3	"	1	"	"	01/23/01	"	
Naphthalene	35.6	28.3	"	"	"	"	"	"	
Pentachlorophenol	ND	7080	"	50	"	"	01/24/01	"	R-03
Phenanthrene	4230	1420	"	"	"	"	"	"	
Pyrene	1350	28.3	"	1	"	"	01/23/01	"	
Surr: 2-Fluorobiphenyl	71.0 %	48-138							
Surr: Nitrobenzene-d5	88.6 %	50-132							
Surr: p-Terphenyl-d14	85.8 %	58-143							
Surr: 2,4,6-Tribromophenol	100 %	19-122							

SED01-29 (P1A0246-29) Soil					Sampled: 01/05/01		Received: 01/09/01		R-05
Acenaphthene	7390	151	ug/kg dry	5	EPA 8270 mod.	01/18/01	01/22/01	1010524	
Acenaphthylene	ND	3020	"	100	"	"	01/23/01	"	
Anthracene	3640	3020	"	"	"	"	"	"	
Benzo (a) anthracene	3190	151	"	5	"	"	01/22/01	"	
Benzo (a) pyrene	1180	151	"	"	"	"	"	"	
Benzo (b) fluoranthene	2430	151	"	"	"	"	"	"	
Benzo (k) fluoranthene	1380	151	"	"	"	"	"	"	
Benzo (ghi) perylene	219	151	"	"	"	"	"	"	
Chrysene	3620	151	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	151	"	"	"	"	"	"	
Fluoranthene	16100	3020	"	100	"	"	01/23/01	"	
Fluorene	6740	151	"	5	"	"	01/22/01	"	
Indeno (1,2,3-cd) pyrene	294	151	"	"	"	"	"	"	
Naphthalene	ND	151	"	"	"	"	"	"	
Pentachlorophenol	ND	15100	"	100	"	"	01/23/01	"	

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-29 (PIA0246-29) Soil					Sampled: 01/05/01 Received: 01/09/01				R-05
Phenanthrene	21700	3020	ug/kg dry	100	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Pyrene	9130	3020	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	85.6 %	48-138							
Surr: Nitrobenzene-d5	87.8 %	50-132							
Surr: p-Terphenyl-d14	95.2 %	58-143							
Surr: 2,4,6-Tribromophenol	131 %	19-122							A-01
SED01-30 (PIA0246-30) Soil					Sampled: 01/08/01 Received: 01/09/01				
Acenaphthene	ND	13.4	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	13.4	"	"	"	"	"	"	
Anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) anthracene	ND	13.4	"	"	"	"	"	"	
Benzo (a) pyrene	ND	13.4	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	13.4	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	13.4	"	"	"	"	"	"	
Chrysene	ND	13.4	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	13.4	"	"	"	"	"	"	
Fluoranthene	ND	13.4	"	"	"	"	"	"	
Fluorene	ND	13.4	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	13.4	"	"	"	"	"	"	
Naphthalene	ND	13.4	"	"	"	"	"	"	
Pentachlorophenol	ND	67.0	"	"	"	"	"	"	
Phenanthrene	ND	13.4	"	"	"	"	"	"	
Pyrene	ND	13.4	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	82.7 %	48-138							
Surr: Nitrobenzene-d5	108 %	50-132							
Surr: p-Terphenyl-d14	87.2 %	58-143							
Surr: 2,4,6-Tribromophenol	86.5 %	19-122							

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
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SED01-40 (P1A0246-31) Soil

Sampled: 01/05/01 Received: 01/09/01

Acenaphthene	ND	29.0	ug/kg dry	1	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	29.0	"	"	"	"	"	"	
Anthracene	ND	29.0	"	"	"	"	"	"	
Benzo (a) anthracene	55.7	29.0	"	"	"	"	"	"	
Benzo (a) pyrene	52.1	29.0	"	"	"	"	"	"	
Benzo (b) fluoranthene	71.5	29.0	"	"	"	"	"	"	
Benzo (k) fluoranthene	41.0	29.0	"	"	"	"	"	"	
Benzo (ghi) perylene	37.1	29.0	"	"	"	"	"	"	
Chrysene	71.7	29.0	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	29.0	"	"	"	"	"	"	
Fluoranthene	133	29.0	"	"	"	"	"	"	
Fluorene	ND	29.0	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	32.4	29.0	"	"	"	"	"	"	
Naphthalene	ND	29.0	"	"	"	"	"	"	
Pentachlorophenol	ND	145	"	"	"	"	"	"	
Phenanthrene	64.3	29.0	"	"	"	"	"	"	
Pyrene	111	29.0	"	"	"	"	"	"	

Surr: 2-Fluorobiphenyl	76.7 %	48-138
Surr: Nitrobenzene-d5	88.9 %	50-132
Surr: p-Terphenyl-d14	86.1 %	58-143
Surr: 2,4,6-Tribromophenol	107 %	19-122

SED01-41 (P1A0246-32) Soil


Sampled: 01/05/01 Received: 01/09/01

R-05

Acenaphthene	52800	3570	ug/kg dry	125	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Acenaphthylene	ND	3570	"	"	"	"	"	"	
Anthracene	13500	3570	"	"	"	"	"	"	
Benzo (a) anthracene	7080	3570	"	"	"	"	"	"	
Benzo (a) pyrene	ND	3570	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	3570	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	3570	"	"	"	"	"	"	
Benzo (ghi) perylene	ND	3570	"	"	"	"	"	"	
Chrysene	6940	3570	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	3570	"	"	"	"	"	"	
Fluoranthene	44000	3570	"	"	"	"	"	"	
Fluorene	41600	3570	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	3570	"	"	"	"	"	"	
Naphthalene	ND	3570	"	"	"	"	"	"	
Pentachlorophenol	ND	17900	"	"	"	"	"	"	

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Project: McCormick and Baxter
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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-41 (P1A0246-32) Soil					Sampled: 01/05/01 Received: 01/09/01				R-05
Phenanthrene	98000	3570	ug/kg dry	125	EPA 8270 mod.	01/18/01	01/23/01	1010524	
Pyrene	24300	3570	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	NR	48-138							S-01
Surr: Nitrobenzene-d5	NR	50-132							S-01
Surr: p-Terphenyl-d14	NR	58-143							S-01
Surr: 2,4,6-Tribromophenol	NR	19-122							S-01
SED01-45 (P1A0246-33) Soil					Sampled: 01/08/01 Received: 01/09/01				R-05
Acenaphthene	52.5	26.8	ug/kg dry	2	EPA 8270 mod.	01/22/01	01/24/01	1010608	
Acenaphthylene	ND	26.8	"	"	"	"	"	"	
Anthracene	59.8	26.8	"	"	"	"	"	"	
Benzo (a) anthracene	115	26.8	"	"	"	"	"	"	
Benzo (a) pyrene	80.8	26.8	"	"	"	"	"	"	
Benzo (b) fluoranthene	95.5	26.8	"	"	"	"	"	"	
Benzo (k) fluoranthene	72.4	26.8	"	"	"	"	"	"	
Benzo (ghi) perylene	63.5	26.8	"	"	"	"	"	"	
Chrysene	144	26.8	"	"	"	"	"	"	
Dibenzo (a,h) anthracene	ND	26.8	"	"	"	"	"	"	
Fluoranthene	408	26.8	"	"	"	"	"	"	
Fluorene	66.4	26.8	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	53.0	26.8	"	"	"	"	"	"	
Naphthalene	ND	26.8	"	"	"	"	"	"	
Pentachlorophenol	ND	134	"	"	"	"	"	"	
Phenanthrene	375	26.8	"	"	"	"	"	"	
Pyrene	295	26.8	"	"	"	"	"	"	
Surr: 2-Fluorobiphenyl	73.8 %	48-138							
Surr: Nitrobenzene-d5	71.3 %	50-132							
Surr: p-Terphenyl-d14	87.8 %	58-143							
Surr: 2,4,6-Tribromophenol	111 %	19-122							

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Miscellaneous Physical/Conventional Chemistry Parameters
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-01 (P1A0246-01) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	41.8	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-02 (P1A0246-02) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	62.8	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-03 (P1A0246-03) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	47.2	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-04 (P1A0246-04) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	49.4	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-05 (P1A0246-05) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	46.8	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-06 (P1A0246-06) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	46.3	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-07 (P1A0246-07) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	44.5	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-08 (P1A0246-08) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	71.0	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-09 (P1A0246-09) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	62.6	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	

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Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


Reported:
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Miscellaneous Physical/Conventional Chemistry Parameters
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-10 (P1A0246-10) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	70.4	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-11 (P1A0246-11) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	76.2	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-12 (P1A0246-12) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	77.8	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-13 (P1A0246-13) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	44.0	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-14 (P1A0246-14) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	71.3	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-15 (P1A0246-15) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	67.1	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-16 (P1A0246-16) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	75.0	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-17 (P1A0246-17) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	71.6	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-18 (P1A0246-18) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	46.3	1.00	% by Weight	1	NCA SOP	01/11/01	01/12/01	1010324	

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Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


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Miscellaneous Physical/Conventional Chemistry Parameters
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-19 (P1A0246-19) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	65.1	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-20 (P1A0246-20) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	50.5	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-21 (P1A0246-21) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	69.2	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-22 (P1A0246-22) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	67.4	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-23 (P1A0246-23) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	49.7	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-24 (P1A0246-24) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	62.5	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-25 (P1A0246-25) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	68.9	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-26 (P1A0246-26) Soil					Sampled: 01/08/01 Received: 01/09/01				
% Solids	47.7	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	
SED01-27 (P1A0246-27) Soil					Sampled: 01/05/01 Received: 01/09/01				
% Solids	53.9	1.00 % by Weight		1	NCA SOP	01/11/01	01/12/01	1010324	

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Miscellaneous Physical/Conventional Chemistry Parameters
North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Dilution	Method	Prepared	Analyzed	Batch	Notes
SED01-28 (P1A0246-28) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	47.3	1.00	% by Weight	1	NCA SOP	01/11/01	01/13/01	1010324	
SED01-29 (P1A0246-29) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	44.3	1.00	% by Weight	1	NCA SOP	01/11/01	01/14/01	1010324	
SED01-30 (P1A0246-30) Soil						Sampled: 01/08/01 Received: 01/09/01			
% Solids	62.7	1.00	% by Weight	1	NCA SOP	01/11/01	01/15/01	1010324	
SED01-40 (P1A0246-31) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	46.2	1.00	% by Weight	1	NCA SOP	01/11/01	01/16/01	1010324	
SED01-41 (P1A0246-32) Soil						Sampled: 01/05/01 Received: 01/09/01			
% Solids	46.9	1.00	% by Weight	1	NCA SOP	01/11/01	01/17/01	1010324	
SED01-45 (P1A0246-33) Soil						Sampled: 01/08/01 Received: 01/09/01			
% Solids	50.8	1.00	% by Weight	1	NCA SOP	01/11/01	01/18/01	1010324	

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Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM- Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1010483 - EPA 3550

Blank (1010483-BLK1)

Prepared: 01/17/01 Analyzed: 01/19/01

Acenaphthene	ND	13.4	ug/kg wet
Acenaphthylene	ND	13.4	"
Anthracene	ND	13.4	"
Benzo (a) anthracene	ND	13.4	"
Benzo (a) pyrene	ND	13.4	"
Benzo (b) fluoranthene	ND	13.4	"
Benzo (k) fluoranthene	ND	13.4	"
Benzo (ghi) perylene	ND	13.4	"
Chrysene	ND	13.4	"
Dibenzo (a,h) anthracene	ND	13.4	"
Fluoranthene	ND	13.4	"
Fluorene	ND	13.4	"
Indeno (1,2,3-cd) pyrene	ND	13.4	"
Naphthalene	ND	13.4	"
Pentachlorophenol	ND	67.0	"
Phenanthrene	ND	13.4	"
Pyrene	ND	13.4	"

Surr: 2-Fluorobiphenyl	62.5	"	83.3	75.0	48-138
Surr: Nitrobenzene-d5	66.9	"	83.3	80.3	50-132
Surr: p-Terphenyl-d14	66.9	"	83.3	80.3	58-143
Surr: 2,4,6-Tribromophenol	62.5	"	83.3	75.0	19-122

LCS (1010483-BS1)

Prepared: 01/17/01 Analyzed: 01/19/01

Acenaphthene	121	13.4	ug/kg wet	167	72.5	50-150
Benzo (a) pyrene	137	13.4	"	167	82.0	50-150
Pentachlorophenol	218	67.0	"	333	65.5	14-176
Pyrene	124	13.4	"	167	74.3	50-150
<i>Surr: 2-Fluorobiphenyl</i>	<i>62.8</i>		<i>"</i>	<i>83.3</i>	<i>75.4</i>	<i>48-138</i>
<i>Surr: Nitrobenzene-d5</i>	<i>66.3</i>		<i>"</i>	<i>83.3</i>	<i>79.6</i>	<i>50-132</i>
<i>Surr: p-Terphenyl-d14</i>	<i>65.5</i>		<i>"</i>	<i>83.3</i>	<i>78.6</i>	<i>58-143</i>
<i>Surr: 2,4,6-Tribromophenol</i>	<i>69.5</i>		<i>"</i>	<i>83.3</i>	<i>83.4</i>	<i>19-122</i>

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM-5 Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1010483 - EPA 3550

Matrix Spike (1010483-MS1)		Source: P1A0246-05		Prepared: 01/17/01		Analyzed: 01/22/01		R-05		
Acenaphthene	289	57.2	ug/kg dry	356	ND	81.2	50-150			
Benzo (a) pyrene	357	57.2	"	356	ND	86.5	50-150			
Pentachlorophenol	653	286	"	712	ND	91.7	14-176			
Pyrene	397	57.2	"	356	117	78.7	50-150			
Surr: 2-Fluorobiphenyl	144		"	178		80.9	48-138			
Surr: Nitrobenzene-d5	135		"	178		75.8	50-132			
Surr: p-Terphenyl-d14	151		"	178		84.8	58-143			
Surr: 2,4,6-Tribromophenol	185		"	178		104	19-122			

Matrix Spike Dup (1010483-MSD1)		Source: P1A0246-05		Prepared: 01/17/01		Analyzed: 01/22/01		R-05		
Acenaphthene	298	57.2	ug/kg dry	356	ND	83.7	50-150	3.07	50	
Benzo (a) pyrene	366	57.2	"	356	ND	89.0	50-150	2.49	50	
Pentachlorophenol	825	286	"	712	ND	116	14-176	23.3	60	
Pyrene	393	57.2	"	356	117	77.5	50-150	1.01	50	
Surr: 2-Fluorobiphenyl	141		"	178		79.2	48-138			
Surr: Nitrobenzene-d5	147		"	178		82.6	50-132			
Surr: p-Terphenyl-d14	155		"	178		87.1	58-143			
Surr: 2,4,6-Tribromophenol	195		"	178		110	19-122			

Batch 1010524 - EPA 3550

Blank (1010524-BLK1) Prepared: 01/18/01 Analyzed: 01/23/01

Acenaphthene	ND	13.4	ug/kg wet
Acenaphthylene	ND	13.4	"
Anthracene	ND	13.4	"
Benzo (a) anthracene	ND	13.4	"
Benzo (a) pyrene	ND	13.4	"
Benzo (b) fluoranthene	ND	13.4	"
Benzo (k) fluoranthene	ND	13.4	"
Benzo (ghi) perylene	ND	13.4	"
Chrysene	ND	13.4	"
Dibenzo (a,h) anthracene	ND	13.4	"
Fluoranthene	ND	13.4	"
Fluorene	ND	13.4	"
Indeno (1,2,3-cd) pyrene	ND	13.4	"
Naphthalene	ND	13.4	"

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1010524 - EPA 3550

Blank (1010524-BLK1)

Prepared: 01/18/01 Analyzed: 01/23/01

Pentachlorophenol	ND	67.0	ug/kg wet							
Phenanthrene	ND	13.4	"							
Pyrene	ND	13.4	"							
Surr: 2-Fluorobiphenyl	75.3		"	83.3		90.4	48-138			
Surr: Nitrobenzene-d5	86.9		"	83.3		104	50-132			
Surr: p-Terphenyl-d14	70.5		"	83.3		84.6	58-143			
Surr: 2,4,6-Tribromophenol	83.7		"	83.3		100	19-122			

LCS (1010524-BS1)

Prepared: 01/18/01 Analyzed: 01/23/01

Q-23

Acenaphthene	188	13.4	ug/kg wet	167		113	50-150			
Benzo (a) pyrene	159	13.4	"	167		95.2	50-150			
Pentachlorophenol	327	67.0	"	333		98.2	14-176			
Pyrene	150	13.4	"	167		89.8	50-150			
Surr: 2-Fluorobiphenyl	77.1		"	83.3		92.6	48-138			
Surr: Nitrobenzene-d5	88.7		"	83.3		106	50-132			
Surr: p-Terphenyl-d14	72.9		"	83.3		87.5	58-143			
Surr: 2,4,6-Tribromophenol	92.9		"	83.3		112	19-122			

Batch 1010608 - EPA 3550

Blank (1010608-BLK1)

Prepared: 01/22/01 Analyzed: 01/24/01

Acenaphthene	ND	13.4	ug/kg wet							
Acenaphthylene	ND	13.4	"							
Anthracene	ND	13.4	"							
Benzo (a) anthracene	ND	13.4	"							
Benzo (a) pyrene	ND	13.4	"							
Benzo (b) fluoranthene	ND	13.4	"							
Benzo (k) fluoranthene	ND	13.4	"							
Benzo (ghi) perylene	ND	13.4	"							
Chrysene	ND	13.4	"							
Dibenzo (a,h) anthracene	ND	13.4	"							
Fluoranthene	ND	13.4	"							
Fluorene	ND	13.4	"							
Indeno (1,2,3-cd) pyrene	ND	13.4	"							
Naphthalene	ND	13.4	"							
Pentachlorophenol	ND	67.0	"							

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Polynuclear Aromatic Compounds and Pentachlorophenol per EPA 8270M-SIM: Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1010608 - EPA 3550

Blank (1010608-BLK1)

Prepared: 01/22/01 Analyzed: 01/24/01

Phenanthrene	ND	13.4	ug/kg wet
Pyrene	ND	13.4	"

Surr: 2-Fluorobiphenyl	66.4	"	83.3	79.7	48-138
Surr: Nitrobenzene-d5	66.5	"	83.3	79.8	50-132
Surr: p-Terphenyl-d14	70.5	"	83.3	84.6	58-143
Surr: 2,4,6-Tribromophenol	75.2	"	83.3	90.3	19-122

LCS (1010608-BS1)


Prepared: 01/22/01 Analyzed: 01/24/01

Q-23

Acenaphthene	144	13.4	ug/kg wet	167	86.2	50-150
Benzo (a) pyrene	160	13.4	"	167	95.8	50-150
Pentachlorophenol	338	67.0	"	333	102	14-176
Pyrene	133	13.4	"	167	79.6	50-150
Surr: 2-Fluorobiphenyl	73.1	"	83.3	87.8	48-138	
Surr: Nitrobenzene-d5	85.4	"	83.3	103	50-132	
Surr: p-Terphenyl-d14	69.9	"	83.3	83.9	58-143	
Surr: 2,4,6-Tribromophenol	85.6	"	83.3	103	19-122	

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Miscellaneous Physical/Conventional Chemistry Parameters - Quality Control

North Creek Analytical - Portland

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch 1010324 - Dry Weight

Duplicate (1010324-DUP1) Source: P1A0246-20 Prepared: 01/11/01 Analyzed: 01/12/01

% Solids	51.5	1.00 % by Weight		50.5		1.96	10
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Duplicate (1010324-DUP2) Source: P1A0253-01 Prepared: 01/11/01 Analyzed: 01/12/01


% Solids	82.6	1.00 % by Weight		80.3		2.82	10
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Duplicate (1010324-DUP3) Source: P1A0279-05 Prepared: 01/11/01 Analyzed: 01/12/01

% Solids	72.7	1.00 % by Weight		72.0		0.968	10
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North Creek Analytical - Portland

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.


Crystal Burkholder, Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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Ecology & Environment
333 SW Fifth Avenue, Suite 608
Portland, OR 97204

Project: McCormick and Baxter
Project Number: 000749.OA01.00.07.96.02
Project Manager: Pete Geiger


Reported:
01/25/01 15:31

Notes and Definitions

- A-01 Outside of acceptance criteria. Since PCP was not detected data reported is not adversely effected.
- Q-23 The Matrix Spike/Duplicate for this batch could not be reported. Source sample contains high levels of target analyte, non-target analyte, and/or matrix interference requiring high dilution.
- R-03 The reporting limit for this analyte was raised due to matrix interference.
- R-05 Reporting limits raised due to dilution necessary for analysis. Sample contains high levels of reported analyte, non-target analyte, and/or matrix interference.
- S-01 The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
- S-02 The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. MRLs are adjusted if %Solids are less than 50%.
- wet Sample results reported on a wet weight basis
- RPD Relative Percent Difference

North Creek Analytical - Portland

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Crystal Burkholder, Project Manager

North Creek Analytical, Inc.
Environmental Laboratory Network

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Raw Data

**Freshwater Sediment Toxicity Testing with
Hyaella azteca and *Chironomus tentans***

Presented to:

Ecology and Environment, Inc.
3335 W. Fifth Avenue, Suite 608
Portland, OR 97204

Presented by:

MEC Analytical Systems, Inc
98 Main Street, Suite 428
Tiburon, CA 94920

February 2001

Ref: 0555

EXECUTIVE SUMMARY

To assess the toxicity of freshwater sediment samples collected on January 5, 2001, Ecology and Environment, Inc. requested that MEC Analytical Systems, Inc. (MEC) perform standard toxicity testing procedures in accordance with Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (U.S. EPA, 2000). The toxicity tests conducted were a 10-day survival bioassay with the amphipod *Hyalella azteca* and a 10-day survival and growth bioassay with the larval midge *Chironomus tentans*.

MEC received 18 samples on January 10, 2001. The samples were split into two control groups, and testing was initiated on January 19, 2001. To assess the relative sensitivity of the test organisms, 96-hour reference toxicant tests were initiated concurrently. Overlying test water (moderately hard mineral water) was replenished twice daily, and organisms were fed once daily in between water renewals. Dissolved oxygen and temperature were measured in one replicate per sample every day. Conductivity, pH, alkalinity, hardness, overlying ammonia, and interstitial ammonia were measured on day 0 and day 10. Tests were terminated on January 29, 2001. Upon termination, mortality for both species was recorded and the ash-free dry weight of the midges was determined and recorded. Results and water/sediment quality data for the *Hyalella* and *Chironomus* tests are summarized in Table 1 and Table 3, respectively. Test procedures and deviations are summarized in Tables 2 and 4.

Following each test, standard U.S. EPA statistical procedures were used to detect significant differences in survival and growth between the test samples and their respective controls. Significant effects ($\alpha = 0.05$) in *Hyalella* and *Chironomus* survival were detected for samples SED01-07 and SED01-29. Significant effects ($\alpha = 0.05$) in *Chironomus* growth were detected for samples SED01-07 and SED01-26 (growth endpoint was not analyzed for SED01-29 due to 100% mortality). Analysis of the reference toxicant results implies normal organism sensitivity as indicated by LC50 values (toxicant concentration resulting in 50% mortality) that fall within two standard deviations of the historical laboratory means. Appendix A contains statistical analysis summary sheets and copies of all laboratory bench sheets. Appendix B contains copies of all chain-of-custody forms.

This study was conducted at the MEC bioassay laboratory in Tiburon, CA under the supervision of Scott M. Bodensteiner.

TABLE 1

SUMMARY REPORT FOR A 10-DAY SOLID-PHASE SEDIMENT BIOASSAY

Test Dates: 19 January - 29 January 2001

Report Issued by:
MEC Analytical Systems, Inc.
Bioassay Division
98 Main St. #428
Tiburon, CA 94920

Report Issued to:
Ecology and Environment, Inc.
3335 W. Fifth Avenue, Suite 608
Portland, OR 97204

REPORT DATE: 02/08/01
PROJECT #: 0555-033

SAMPLE AND BIOASSAY INFORMATION

TEST INFORMATION

Control Water: Moderately Hard Water
(Diluted mineral water)
Exposure volume: 100 mL sediment;
300 mL Mod water
Test chambers: 500 mL glass jar
Concentrations (%): 100
Organisms/chamber: 10

SPECIES INFORMATION

Species: *Hyallela azteca*
Source: Aquatic Biosystems
Fort Collins, CO
Age: 8 days

SAMPLE INFORMATION

Sample Type: Sediment
Client Sample ID: SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,
-11,-28,-22,-21,-09,-26
Client PO: 133671-C10
Sample Date: 1/5/01 - 1/8/01
Sample Received: 1/10/01
MEC Sample ID #: T010110.03 through .20

TEST SUMMARY

Client Sample ID	MEC Sample ID	Mean Survival (%)	Water Quality Summary (Min./Max.)							
			Temp. (°C)	pH (units)	DO (mg/L)	Cond (uS/cm)	Alk (mg/L)	Hard (mg/L)	Ammonia	
									Overlying (mg/L)	Pore (mg/L)
Control	T010110.03	87.5 ± 9.7	21.9/23.8	7.99/8.00	4.6/8.5	209/262	90/98	92/92	0.17/2.02	0.57/2.74
SED01- 27	T010110.04	82.5 ± 9.7	22.0/23.5	7.00/7.50	3.1/8.0	155/189	84/100	78/102	1.07/2.02	1.96/3.80
SED01- 16	T010110.05	91.3 ± 6.0	22.0/23.8	7.26/7.76	4.4/6.6	181/192	84/100	86/98	0.11/0.57	0.84/0.86
SED01- 15	T010110.06	81.3 ± 13.6	21.8/23.7	7.07/7.56	4.6/6.7	158/175	86/110	88/100	0.11/2.02	0.38/0.85
SED01- 01	T010110.07	86.3 ± 13.2	21.7/23.2	7.00/7.54	4.6/7.0	235/244	104/106	94/100	0.20/1.49	0.57/1.28
SED01- 07	T010110.08	28.8* ± 16.2	21.5/23.1	7.00/7.44	4.2/6.5	167/282	88/102	90/92	3.13/3.19	8.20/12.2
SED01- 24	T010110.09	86.3 ± 8.6	21.6/23.1	7.25/7.66	4.8/6.2	180/222	98/100	92/100	0.33/0.97	0.84/1.35
SED01- 19	T010110.10	78.8 ± 13.6	21.8/23.1	7.61/7.69	4.8/7.0	175/179	92/106	86/98	0.11/1.06	0.32/1.38
SED01- 12	T010110.11	67.5 ± 17.9	21.5/23.1	7.67/7.75	4.8/6.6	201/221	92/112	102/108	0.11/1.09	0.22/0.84
SED01- 05	T010110.12	81.3 ± 8.7	21.9/23.1	7.08/7.56	4.6/6.2	158/188	78/114	82/102	1.19/2.44	3.37/3.69
SED01- 29	T010110.13	8.8* ± 7.8	21.7/23.1	7.24/7.51	4.6/6.4	160/163	86/110	84/100	1.38/2.34	2.40/3.73
SED01- 18	T010110.14	81.3 ± 11.7	21.6/23.3	7.23/7.46	4.4/6.3	153/176	84/90	82/84	1.43/1.81	3.52/6.88
SED01- 30	T010110.15	90.0 ± 8.7	21.6/24.0	7.29/7.49	4.3/6.7	165/178	90/98	92/98	0.26/1.32	0.51/1.60
SED01- 11	T010110.16	87.5 ± 9.7	22.0/23.6	7.22/7.55	4.7/7.1	151/156	80/112	100/102	0.34/1.70	1.70/2.48
SED01- 28	T010110.17	90.0 ± 7.1	22.0/23.5	6.99/7.52	4.7/6.6	161/163	76/104	82/92	0.64/2.24	3.23/3.26
SED01- 22	T010110.18	88.8 ± 10.5	22.0/23.5	7.30/7.56	4.4/6.7	189/235	94/100	98/98	0.37/0.80	1.17/3.00
SED01- 21	T010110.19	80.0 ± 10.0	22.2/23.8	7.39/7.60	4.8/6.6	153/179	86/100	78/98	<0.01/0.64	0.42/1.35
SED01- 09	T010110.20	83.8 ± 7.0	22.0/23.8	7.10/7.59	4.7/6.6	158/168	90/104	90/92	0.26/1.55	0.51/1.29
SED01- 26	T010110.21	80.0 ± 13.2	22.0/23.6	7.14/7.88	4.6/6.8	188/204	94/112	86/106	0.27/2.11	0.91/2.33

* - Significantly different from the controls (α = 0.05)

REFERENCE TOXICANT SUMMARY

Reference Toxicant: Copper as copper sulfate
Concentrations: 125, 250, 500, 1000 and 2000 ug/L
Organisms/chamber: 10
Exposure volume: 200 mL
Test chambers: 250 mL beakers

Conc. (ug/L)	Mean % Survival
Control	90
125	40
250	13
500	0
1000	0
2000	0

LC50 (mg/L): 118.5
Lab Mean LCS0: 380.1 +/- 275.1
Sensitivity: Normal

Reference: U.S. EPA, Methods for Measuring the Toxicity and
Bioaccumulation of Sediment-associated
Contaminants with Freshwater Invertebrates.
EPA/600/R-99/064, March 2000.

TABLE 2

**Test Procedure and Organism Data for the 10 Day Solid Phase Bioassay
Using *Hyaella azteca* (USEPA, 2000)**

Sample Identification

Sample ID(s)	SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,-11,-28,-22,-21,-09,-26
Date Sampled	January 5, 2001
Date Received at MEC	January 10, 2001
Volume Received	5 liters/sample
Sample Storage Conditions	4 Degrees Celsius - dark
Sample Treatment	None

Test Species

	<i>Hyaella azteca</i>
Supplier	Aquatic Biosystems
Date Acquired	January 19, 2001
Acclimation Time	6 hours
Age Group	8 days

Test Procedures

Test Location	MEC Tiburon lab; 20 deg. Room
Test Type; Duration	Acute/Renewal; 10 days
Test Dates	January 19, 2001 - January 29, 2001
Control Water Source	Moderately hard water (diluted mineral water)
Test Photoperiod	16 hour light : 8 hour dark
Test Chamber	500 mL mason jars
Replicates/Treatment	8
Organisms/Replicate	10
Exposure Volume	100 mL sediment/ 300 mL water
Feeding	1.0 mL YCT slurry daily
Water Renewal	Twice daily
Test Temperature (°C)	Recommended: 23±3 Actual: 21.5 - 24.0
Test Dissolved Oxygen (mg/L)	Recommended: > 2.5 Actual: 3.1 - 8.5
Test pH	Recommended: 7.5±1.0 Actual: 6.99 - 8.00
Control Survival	Required: > 80% Actual: Control 1 - 82.9% Control 2 - 87.5%

Deviations from Procedures

Replicate 1 of Control 1 was errantly not loaded with organisms. Therefore, all samples were analyzed via comparison to Control 2.

TABLE 3

SUMMARY REPORT FOR A 10-DAY SOLID-PHASE SEDIMENT BIOASSAY

Test Dates: 19 January - 29 January 2001

Report Issued by:
MEC Analytical Systems, Inc.
Bioassay Division
98 Main St. #428
Tiburon, CA 94920

Report Issued to:
Ecology and Environment, Inc.
3335 W. Fifth Avenue, Suite 608
Portland, OR 97204

REPORT DATE: 02/08/01
PROJECT #: 0555-051

SAMPLE AND BIOASSAY INFORMATION

TEST INFORMATION

Control Water: Moderately Hard Water
(Diluted mineral water)
Exposure volume: 300 mL sediment;
600 mL Mod water
Test chambers: 1L glass jar
Concentrations (%): 100
Organisms/chamber: 10

SPECIES INFORMATION

Species: *Chironomus tentans*
Source: Aquatic Biosystems
Fort Collins, CO
Age: Third instar larvae

SAMPLE INFORMATION

Sample Type: Sediment
Client Sample ID: SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,
-11,-28,-22,-21,-09,-26
Client PO: 133671-C10
Sample Date: 1/5/01 - 1/8/01
Sample Received: 1/10/01
MEC Sample ID #: T010110.03 through .20

TEST SUMMARY

Client Sample ID	MEC Sample ID	Mean Survival (%)	Mean Ash Free Dry Weight (mg)	Water Quality Summary (Min./Max.)							Ammonia	
				Temp. (°C)	pH (units)	DO (mg/L)	Cond (uS/cm)	Alk (mg/L)	Hard (mg/L)		Overlying (mg/L)	Pore (mg/L)
Control 1	T010110.03	71.3 ± 17.6	1.39 ± 0.50	22.0/23.2	7.66/7.95	2.5/8.4	237/250	90/98	92/92		0.17/2.02	0.57/2.74
SED01- 27	T010110.04	77.5 ± 13.9	1.31 ± 0.34	22.0/23.8	7.62/7.81	1.8/8.3	193/195	84/100	78/102		1.07/2.02	1.96/3.80
SED01- 16	T010110.05	82.5 ± 13.9	1.76 ± 0.72	21.6/24.0	7.61/7.68	2.5/8.1	194/219	84/100	86/98		0.11/0.57	0.84/0.86
SED01- 15	T010110.06	73.8 ± 16.5	2.01 ± 0.25	21.6/23.7	7.34/8.07	2.0/8.1	169/187	86/110	88/100		0.11/2.02	0.38/0.85
SED01- 01	T010110.07	75.0 ± 7.1	1.57 ± 0.46	21.8/23.6	7.21/8.07	2.6/7.4	201/231	104/106	94/100		0.20/1.49	0.57/1.28
SED01- 07	T010110.08	12.5* ± 10.9	0.30* ± 0.26	21.5/23.5	7.19/7.78	2.8/8.0	169/187	88/102	90/92		3.13/3.19	8.20/12.2
SED01- 24	T010110.09	65.0 ± 14.1	1.15 ± 0.32	21.6/23.7	7.44/8.11	2.6/7.9	206/209	98/100	92/100		0.33/0.97	0.84/1.35
SED01- 19	T010110.10	86.3 ± 8.6	1.43 ± 0.47	22.0/23.4	7.41/7.89	2.8/7.2	165/185	92/106	86/98		0.11/1.06	0.32/1.38
SED01- 12	T010110.11	52.5 ± 17.1	1.31 ± 0.25	21.6/23.4	7.48/7.56	1.3/8.2	189/224	92/112	102/108		0.11/1.09	0.22/0.84
SED01- 05	T010110.12	72.5 ± 10.9	1.42 ± 0.24	22.0/23.5	7.26/8.09	2.6/7.4	170/171	78/114	82/102		1.19/2.44	3.37/3.69
Control 2	T010110.03	70.0 ± 15.0	1.26 ± 0.49	21.5/23.4	7.71/8.12	2.9/8.5	234/269	90/98	92/92		0.17/2.02	0.57/2.74
SED01- 29	T010110.13	0*	NA	21.7/23.5	7.35/8.15	2.8/7.6	166/196	86/110	84/100		1.38/2.34	2.40/3.73
SED01- 18	T010110.14	75.0 ± 17.3	1.47 ± 0.36	21.5/23.5	7.17/8.01	1.8/8.4	170/173	84/90	82/84		1.43/1.81	3.52/6.88
SED01- 30	T010110.15	68.8 ± 16.2	1.59 ± 0.20	21.3/23.6	7.29/8.19	2.9/8.6	164/211	90/98	92/98		0.26/1.32	0.51/1.60
SED01- 11	T010110.16	63.8 ± 16.5	1.18 ± 0.24	21.8/23.5	7.33/8.07	2.6/8.6	156/200	80/112	100/102		0.34/1.70	1.70/2.48
SED01- 28	T010110.17	68.8 ± 16.2	1.05 ± 0.25	22.0/23.5	7.20/8.13	2.6/8.2	162/179	76/104	82/92		0.64/2.24	3.23/3.26
SED01- 22	T010110.18	65.0 ± 10.0	1.04 ± 0.13	22.0/23.5	7.28/8.09	2.5/8.2	214/225	94/100	98/98		0.37/0.80	1.17/3.00
SED01- 21	T010110.19	76.3 ± 25.0	1.68 ± 0.50	22.0/23.4	7.22/8.14	1.8/8.5	159/197	86/100	78/98		<0.01/0.64	0.42/1.35
SED01- 09	T010110.20	56.3 ± 18.0	1.06 ± 0.30	22.0/23.3	7.16/7.34	1.1/8.3	158/217	90/104	90/92		0.26/1.55	0.51/1.29
SED01- 26	T010110.21	51.3 ± 28.5	0.62* ± 0.34	21.9/23.2	7.24/8.11	1.6/8.0	184/210	94/112	86/106		0.27/2.11	0.91/2.33

* - Significantly different from the controls (α = 0.05)

REFERENCE TOXICANT SUMMARY

Reference Toxicant: Copper as copper sulfate
Concentrations: 250, 500, 1000, 2000 and 4000 ug/L
Organisms/chamber: 1
Exposure volume: 20 mL
Test chambers: 25 mL plastic cups

Conc. (ug/L)	Mean % Survival	LC50 (mg/L):
Control	80	2000
250	70	Lab Mean LC50: 1003 +/- 725.4
500	50	Sensitivity: Normal
1000	60	
2000	50	
4000	30	

Reference: U.S. EPA, Methods for Measuring the Toxicity and
Bioaccumulation of Sediment-associated
Contaminants with Freshwater Invertebrates.
EPA/600/R-99/064, March 2000.

TABLE 4

**Test Procedure and Organism Data for the 10 Day Solid Phase Bioassay
Using *Chironomus tentans* (USEPA, 2000)**

Sample Identification

Sample ID(s)	SED01-27,-16,-15,-01,-07,-24,-19,-12,-05,-29,-18,-30,-11,-28,-22,-21,-09,-26
Date Sampled	January 5, 2001
Date Received at MEC	January 10, 2001
Volume Received	5 liters/sample
Sample Storage Conditions	4 Degrees Celsius - dark
Sample Treatment	None

Test Species

	<i>Chironomus tentans</i>
Supplier	Aquatic Biosystems
Date Acquired	January 19, 2001
Acclimation Time	6 hours
Age Group	Third instar

Test Procedures

Test Location	MEC Tiburon lab; 20 deg. Room	
Test Type; Duration	Acute/Renewal; 10 days	
Test Dates	January 19, 2001 - January 29, 2001	
Control Water Source	Moderately hard water (diluted mineral water)	
Test Photoperiod	16 hour light : 8 hour dark	
Test Chamber	1 L mason jars	
Replicates/Treatment	8	
Organisms/Replicate	10	
Exposure Volume	300 mL sediment/ 600 mL water	
Feeding	1.5 mL Tetramin slurry daily	
Water Renewal	Twice daily	
Test Temperature (°C)	Recommended: 23±3	Actual: 21.3 - 23.8
Test Dissolved Oxygen (mg/L)	Recommended: > 2.5	Actual: 1.1 - 8.6
Test pH	Recommended: 7.5±1.0	Actual: 7.16 - 8.19
Control Survival	Required: > 70%	Actual: Control 1 - 71.3% Control 2 - 70.0%

Deviations from Procedures

Test fell below recommended dissolved oxygen (DO) concentration on Day 5.
Test was aerated and acceptable DO levels were restored.

REFERENCES

U.S. EPA. 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064, March 2000.